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FOR MANAGERS OF MANUFACTURING TECHNOLOGY

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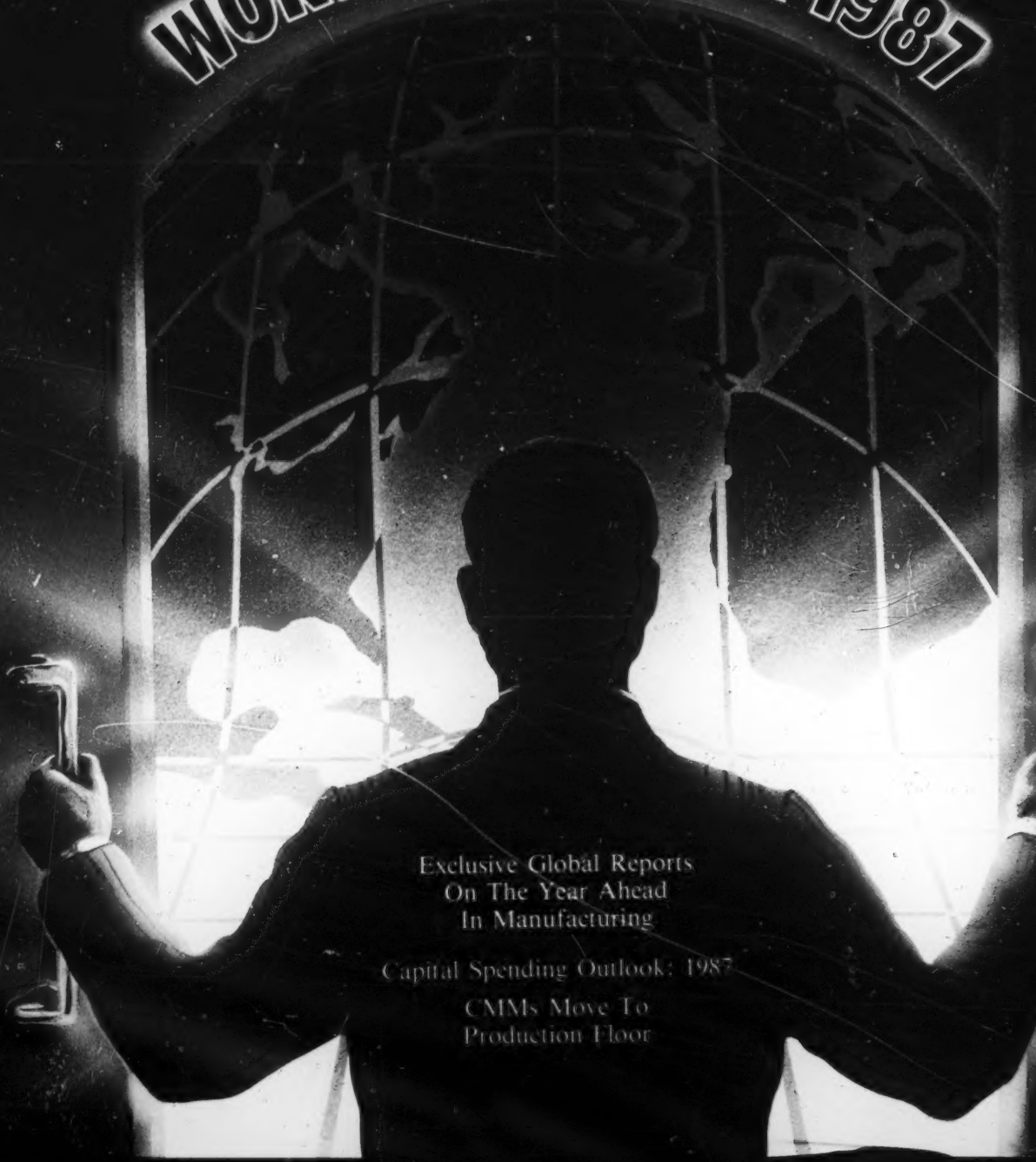
WORLD OUTLOOK 1987



Exclusive Global Reports
On The Year Ahead
In Manufacturing

Capital Spending Outlook: 1987

CMMs Move To
Production Floor

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53 CAPITAL SPENDING OUTLOOK: 1987

PRODUCTION Magazine presents the 19th annual survey of capital investment intentions. Overall, 1987 looks like a repeat of 1986, with the exception of assembly equipment and gaging-inspection-testing equipment.

56 CMMS MOVE TO PRODUCTION FLOOR

As manufacturers integrate coordinate measuring machines into product design, the function of CMMs has moved to include engineering and development in addition to inspection.

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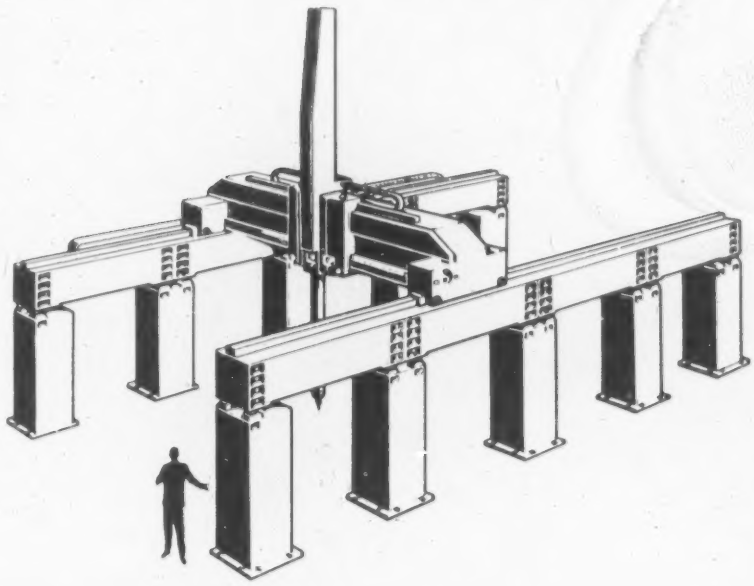


Artist's rendering depicts the relative size of the Digital Electronic Automation (DEA) computer-controlled gantry coordinate measuring machine (CMM) recently purchased by Boeing Commercial Airline Co. The machine features the largest volumetric measuring range of any unit of its type in the U.S.

The CMM is a DEA Model 5612C/CX. It is a gantry-type machine implementing two perpendicular guideways along which a horizontal unit travels forward and back (x-axis). Attached to that horizontal unit is a vertically-oriented probe that travels up and down (z-axis) and side by side between the guideways (y-axis). The workpiece is supported by the machine base; the work envelope is 100″ (z), 160″ (y) and 500″ (x).

The gantry CMM will be used for point-to-point measuring and scanning of airframe tooling and components. It will collect data from undefined workpiece and tooling surfaces. This data, in turn, will help computerize the design of parts and tooling, verify that pieces have required dimensional accuracies and optimize production operations.

The machine also will inspect surface contours and hole and surface locations of parts and tooling, and inspect tooling according to conventional layout.

The model 5612C/CX will become the fourth DEA gantry coordinate measuring machine in the Boeing Fabrication Division facility. Three dual-gantry CMMs, DEA Model 4512P, are currently used.

Diecasting Industry Plateaus in 1986

The U.S. diecasting industry will soften in both sales and metal tonnage this year but is forecast to rebound in 1987, according to Peter A. R. Findlay, president of the American Die Casting Institute (ADCI).

During the 58th annual meeting in Chicago, Mr. Findlay portrayed the industry as having plateaued within the $5.5 to $6.5 billion annual sales range since the 1983 recession. Lower metal prices, increased foreign competition from other processes and customer demands to hold, or lower, prices are major reasons for the plateau, according to Mr. Findlay.

The ADCI is responding with the introduction of new programs to improve competitiveness, technical levels and profitability of diecasting firms, as the industry rebounds next year with a forecasted 10 percent rise in aluminum consumption.

A $400,000 Department of Commerce and industry marketing-technology enhancement program will be implemented to increase user awareness of diecasting benefits, increase the technological advantages of the domestic industry and expand the market, according to ADCI Chairman Russell Davis.

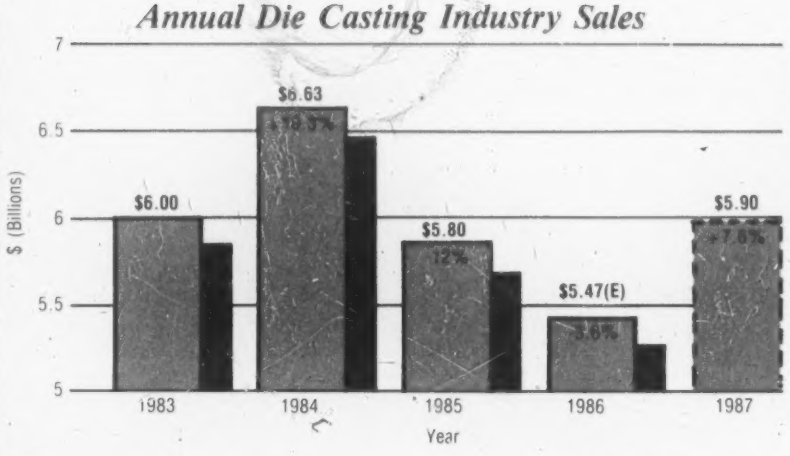
"The $6 billion diecasting industry will use an injection of federal assistance to energize a major marketing program designed to increase the competitiveness of U.S. diecasters," said Mr. Davis.

Central to the campaign is a $200,000 one-year grant from the Department of Commerce Trade Adjustment Assistance Program, with matching funding supplied by ADCI.

"This is an industry wide self-help program which fights a serious offshore threat without the need for quotas, tariffs, subsidies or restrictive international agreements," explained Mr. Davis.

A Diecasting Development Council (DDC) is being organized to create a comprehensive, continuing product and market development program. In the DDC kick-off speech to the industry, Funding Drive Finance Chairman Walter G. Treiber, Jr., of Chicago White Metal Casting, spoke of the need for a united response to pressures to the diecasting industry's markets from substandard offshore competitors, plastics and revitalized metalforming processes.

"Non-spec alloys and inferior tooling act to degrade our entire industry," said Mr. Treiber. "Aggressive competition in the engineering materials area is growing stronger. Companies in the resins industry have become a 'plastics mafia' and are



transforming themselves from materials suppliers to product designers and parts producers for original equipment manufacturers. They are spending millions researching enhanced resins—and are working on advanced composites—aimed squarely at displacing metals producers."

Mr. Treiber said that over the next six to twelve months he plans to develop a $1-$1.5 million industry investment fund with which to aggressively implement programs to thwart industry and foreign competitors.

It was also announced that the diecasting industry will have its own SIC code, beginning January 1.

The U.S. Government's Technical Committee on Industrial Classification of the Office of Management and Budget announced that two new four-digit codes for the diecasting industry will be published in the 1987 revision of the SIC Manual, separating diecasting from foundries and recognizing it as a different entity with a unique technology and its own manufacturing techniques.

Aluminum diecastings will be designated by the code 3363; 3364 will apply to non-ferrous diecastings, except aluminum.

Allen-Bradley To Map Ford's Communication Highway

The Communications Division of Allen-Bradley, a Rockwell International company, has been selected by Ford Motor Company to act as project manager for the installation of broadband cable systems in 23 Ford body and assembly division plants throughout North America.

Under this program, Allen-Bradley will be responsible for the design, installation and certification of each broadband cable system. Each system will meet or exceed IEEE 802.7 and MAP specifications for broadband communication.

Upon installation by the end of 1987, the 23 networks will represent a total of 40-million square feet or nearly two square miles at a cost approaching $6 million.

The communication system will provide the Ford plants with an integrated communication medium capable of supporting simultaneous two-way transmission of data, video and audio signals using equipment from multiple suppliers. Every system will provide continuous communications to and from any location within each plant.

Commerce/ Auto Parts To Establish Industry Office in Japan

The Commerce Department will assist the U.S. automotive parts industry in opening an office in Japan to promote sales of U.S. automotive products. The office will open early in 1987. It will undertake a number of initiatives to help open Japanese markets to U.S. manufacturers and improve the nations' understanding of each other's technical, political and trade positions.

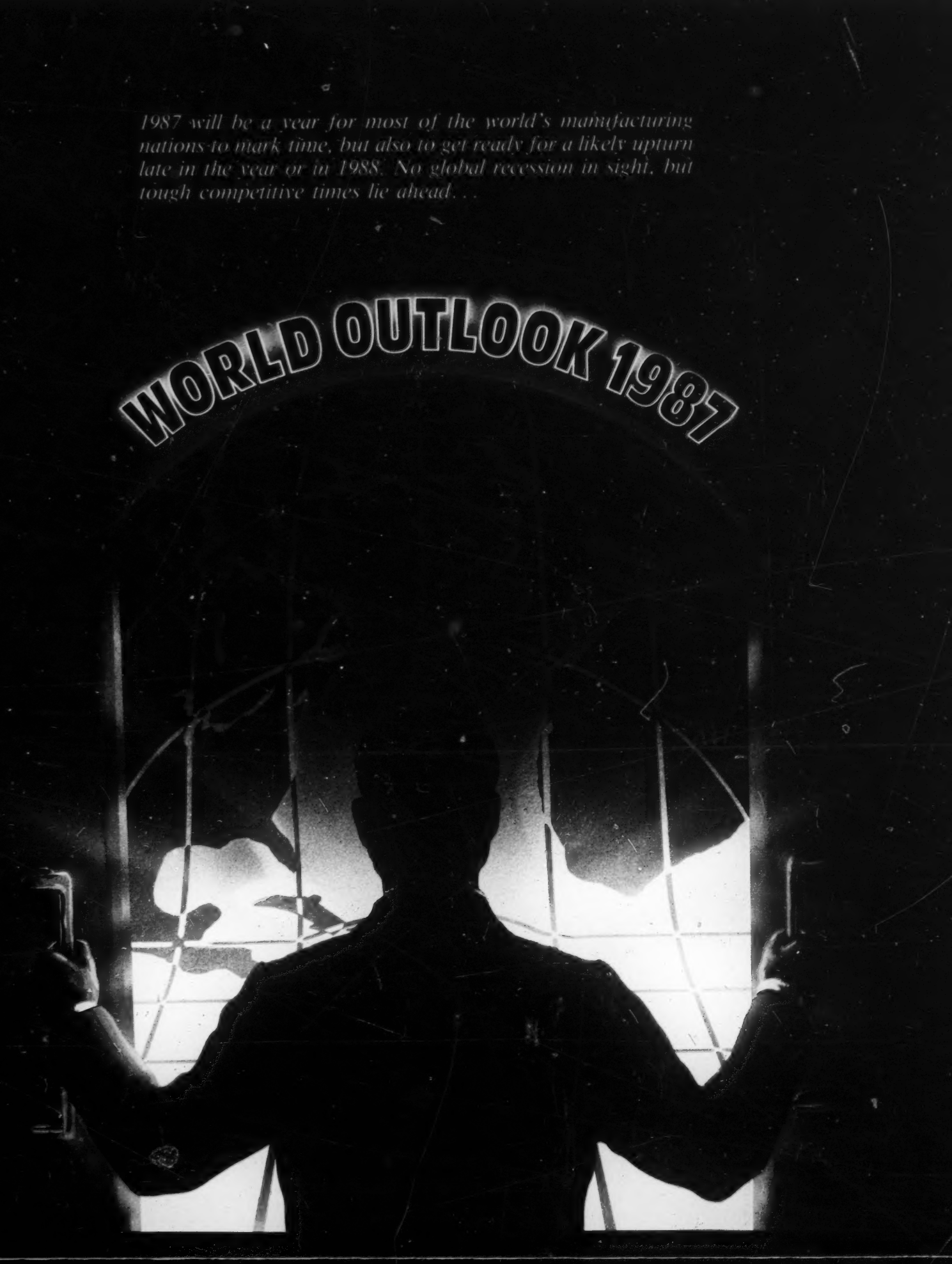
Commerce Under Secretary for International Trade Bruce Smart said, "The objective of this joint government and industry effort is to ensure competitive U.S. automotive products companies gain access and become suppliers to Japan's OEM and aftermarket sectors.

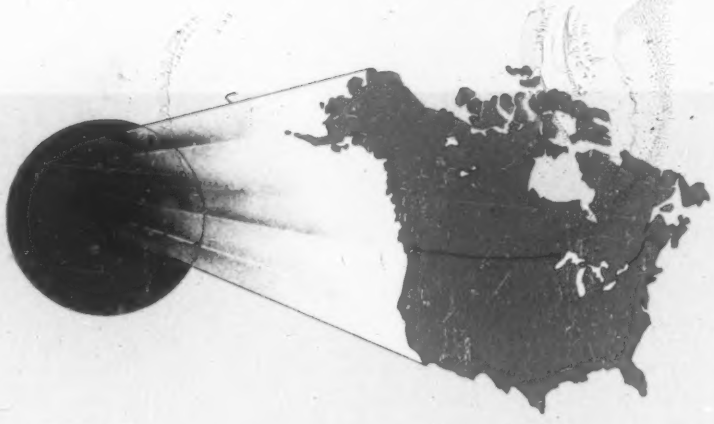
"Statistics support the perception in the U.S. that American auto parts suppliers are not welcome in the inner circles of Japan's auto companies and their traditional suppliers," Mr. Smart added. " While Japan's auto parts companies sold almost $5 billion in the U.S. last year, American auto parts companies supplied only one percent of Japan's $55 billion market," he said.

The Commerce Department's Office of Trade Adjustment Assistance and the Motor and Equipment Manufacturers Association (MEMA) will fund the project. During the first year, the department will provide $464,300 and industry will provide $377,150. A two-year project is anticipated, with second-year funding contingent on performance and the availability of trade adjustment assistance funds. After two years of partial funding from the department, the office is expected to be completely

1987 will be a year for most of the world's manufacturing nations to mark time, but also to get ready for a likely upturn late in the year or in 1988. No global recession in sight, but tough competitive times lie ahead...

WORLD OUTLOOK 1987





United States and Canada

Spurred on by resilient consumer spending patterns, the economic upturn that began in late 1982 and continued at a slower pace through 1985 and 1986 appears to be entrenched enough to last at least another year.

UNITED STATES

HOW LONG CAN THE CURRENT RECOVERY last? That is the major question facing economists and corporate officials as they survey the 1987 U.S. economic landscape. Spurred on by resilient consumer spending patterns, the economic upturn that began in late 1982 and continued at a slower pace through 1985-86 apparently will last at least another year. But the upswing already has outlasted the average three-year cyclical pattern, so despite the prevailing cautious optimism, in the back of many economic minds lurks uncertainty.

Will record budget deficits and high consumer debt levels herald higher interest rates and short-circuit the recovery? Will oil prices rise, aiding the oil patch but reigniting inflation and aggravating the trade deficit? What impact will the giant tax reform bill have on corporate capital spending patterns? These are all key questions facing the economic soothsayers.

Economic Momentum

Consensus is that the economy will continue to grow in 1987, but at an unspectacular 3 percent rate of growth. When the current boom began, annual GNP growth was roughly double the projected 1987 rate. Nevertheless, the 3 percent projection from the Council of Economic Advisers is relatively positive news, since the GNP grew at a dismal 0.6 percent annual rate as late as the second quarter of 1986 before accelerating to between 2.5 and 3 percent at the end of the year.

This has acted to keep unemployment down as a whole, to below 7 percent (far below the nearly 10 percent peak in 1982 when the current upturn began). Most economists expect the jobless rate to remain near 6.7 percent through 1987. Like the GNP forecast, this is a decent but uninspiring bit of news. "The economic recovery has generated the momentum that's kept us going at a good rate," explained one Commerce Department official. "It would appear the positive and negative factors pretty much outweigh each other at this point."

The bad news in the employment picture is that most of the jobs being created have been in the relatively low-wage service and retail trade areas. Manufacturing continues to be buffeted by imports in machine tools, steel, automobiles and productivity enhancements (automation). "Jobs have been increasing quite rapidly," said a Commerce Department official. "Unemployment has been remarkably stable. But the job increases have been heaviest in the service industries, the retail trades and in the health, financial and real estate areas."

It is likely that 1987 will see more of the same. Manufacturing employment dipped from 19.3 million in January 1986 to 19:1 million in September, before increasing slightly at year's end. The average will come in well below the 19.31 million employment figure recorded in 1985 and the 19.38 million figure posted in 1984. Look for further dips in the manufacturing sector in 1987, even without a major recession.

"Manufacturing productivity has been high; there has been a heavier investment in automation," says one economist. "Production rates have increased between 3 and 4 percent annually. So manufacturing is growing, but the growth is occurring with fewer people."

Inflation has remained under control, too, with consumer prices actually falling at the beginning of the year because of the sharp drop in oil prices. Oil prices are expected to steady by the end of 1987. The dollar may continue its slight decline in value, too. Both factors should combine to produce an annual 1987 inflation rate of between 3 and 3.5 percent, a healthy development that does not signal any dramatic economic change.

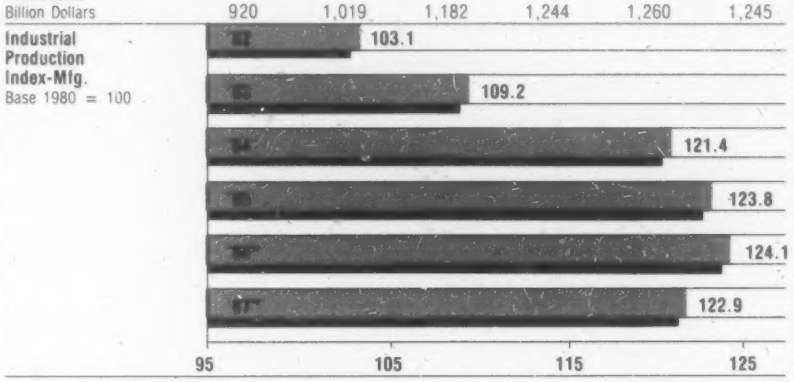
Tax Impact Uncertain

One of the biggest economic question marks in 1987 is the impact of

UNITED STATES

Gross Domestic Product (GDP): $1.6 Trillion (1984)

	'82	'83	'84	'85	'86*	'87*
GNP Trillion Dollars	3.2	3.3	3.6	3.6	3.7	3.8
Foreign Trade Billion Dollars						
Imports	255.0	270.0	341.2	361.6	384.2	363.9
Exports	212.2	200.5	217.9	213.1	216.4	223.6
Trade Balance	-43	-69	-123	-149	-168	-140
Durable Goods Production Billion Dollars	920	1,019	1,182	1,244	1,260	1,245



*Estimate, PRODUCTION Magazine
Source: U.S. Department of Commerce

the tax reform act. Low inflation and interest rates should provide incentives for business investments. Capital spending shot up 8.7 percent in 1985 and then dropped back to between 2.5 and 3 percent in 1986 (adjusted for inflation, it was more like 1 percent), a fact that was blamed primarily on the uncertainty surrounding tax reform.

Now the uncertainty has ended, but that doesn't mean business is about to dig deep for funds for new investment. The new tax bill shifts approximately $125 billion in taxes from households to businesses between 1987 and 1992. Abolition of the investment tax credit and increases in tax rates on capital gains likely will result in reduced spending on R&D, equipment and buildings. This had led some corporate officials and economists to warn that the risk of recession is greater this year. But other executives believe most of the damage already has occurred. Under this scenario, barring a general business downturn, capital spending could actually climb slightly this year, especially if companies move ahead with the investments that were put on hold while the lengthy tax debate raged.

"As we see it, the tax bill can cut both ways," explained a Commerce Department economist. "Right now it is resulting in some movement of assets, brokerage and so forth, that generates a little growth in the GNP but is not really that strong a factor for the economy."

A more negative concern: The prolonged upswing has been propelled by the large run-up on consumer and instalment debt. With interest write-offs eliminated, will buyers be as willing to spend or will they opt for paying off their debt, placing a brake on the economy? This concern is counterweighed by the fact that consumers could turn to (deductible) home equity loans to finance their debt, thus keeping purchasing patterns stable. A similar situation occurred in the 1977-79 recession and helped spin the economy around.

Ultimately, the question of confidence, both in the business and consumer sectors, holds the key to 1987's economic prognosis. For the last four years, there have been few economic wolves at the door, confidence levels have been high and economic growth has chugged along at a remarkably resilient rate. Most bets are on this trend continuing in 1987. But unforeseen and unexpected political events can always intrude, bursting the bubble of optimism that has prevailed for so long a period. As a result, the general overview is positive but highly cautious. For manufacturers, caution is more prevalent as the general trends prevalent in 1985 and 1986 (import competition, the move toward automation, cost-cutting in payrolls) seem likely to continue.

Perhaps no company better represents the dilemma facing American manufacturers than does General Motors Corp. With its market share sliding and off-shore manufacturers undercutting its pricing, GM responded in a classic fashion: The company announced an ambitious, mega-billion dollar plan to move its production and manufacturing process into the 21st century.

The plan placed a heavy emphasis on high technology and included large capital investments in automaking and the acquisition of two large and well-respected companies: Dallas-based Electronic Data Systems and Los Angeles-based Hughes Aircraft Co. Both firms were expected to play major roles in GM's move to remain a dominant global manufacturer.

The program was widely heralded as bold and innovative. But as 1987 dawns, GM's strategic plan is in tatters—a stark reminder to manufacturers of all stripes that ambitious strategies, no matter how well founded or broadly mapped, cannot be a guaranteed panacea for the problems nagging American industry.

The new year sees GM licking its wounds and planning new cutbacks. The company announced broad layoffs in its auto manufacturing sector

at the end of 1986 that saw 11 factories in four states close, laying off 29,000 people to save an estimated $500 million annually in fixed costs.

Meanwhile, a year-old "factory of the future" in Detroit, unveiled in 1986 with great fanfare, has been plagued with breakdowns and delays. GM tried to peddle its newly acquired EDS affiliate; merging the two companies' vastly different corporate cultures has proven impossible. Layoffs have hit Hughes Aircraft and GMF-Robotics, a factory automation affiliate. Now GM has decided to scale back its highly publicized Saturn Corp., a high-tech master plan to produce small cars profitably in the U.S.

Manufacturing Dilemma

Other auto manufacturers may not be in quite the quagmire that GM finds itself. Even so, the new year promises to be one of careful retrenching for the domestic industry, despite fairly strong vehicle sales and continuing economic expansion. Ray Windeker, Ford Motor Company's research and analyst manager, is cautiously optimistic even though auto sales likely will drop below this year's anticipated 11.2 million figure.

"It's like throwing darts," confessed Mr. Windeker, weighing the overall economy, as well as the industry's own propensity to announce price rebates and other incentives (as the automakers did in 1986), skewing the sales figures and "staving off and forestalling the expected payback" in new auto sales.

Mr. Windeker foresees 10.5 to 10.6 million new vehicle sales in 1987, unless major rebate programs are announced again, creating an unanticipated sales spurt.

With sales down and imports from Japan, Korea, Taiwan and elsewhere expected to climb slightly to between 27 and 29 percent of the market (compared to 25.6 percent in 1985), Mr. Windeker noted that "it's the domestic manufacturers who are going to bear the brunt" of the expected fall-off.

Ford expects to see its market share increase to between 18 and 20 percent, since the manufacturing lines should be operating at capacity (as they did in 1986), and production of its popular Sable and Taurus models, introduced in mid-1986, will be underway for the full year. Mr. Windeker noted that Ford's strategy remains maintaining manufacturing capacity for only an average year of vehicle sales, which means the company loses market share in strong sales years, but does not carry the expenses of extra capacity during leaner years.

Basic Industries Weak

Other manufacturers face a similarly mixed situation in 1987. Steel, machine tool and other heavy manufacturers continue to face strong competition from European and Japanese imports. But their situation is being aided slightly by the weakened dollar, which is making it easier for them to export their own goods.

Machine tool exports, for example, appeared to be heading for the best year in four years, even while the domestic manufacturers continue to capture a dwindling share of the domestic market. Canada, Mexico, China, South Korea and even the United Kingdom and Japan are emerging as good potential markets for U.S. machine tool manufacturers.

The oil patch is another industry in difficulty. With oil prices dropping dramatically in 1986, domestic oil and gas drilling is disappearing.

Ike Kerridge, an economic analyst with Texas-based Hughes Tool Co., noted that only an average of 964 U.S. rigs operated in 1986, compared to an average of 1,983 in 1985 (which was itself a depressed year for the industry). He foresees a future slump to an average count of 850 in 1987. "I'm not optimistic it will be a strong year. Capital spending will be down, and the tax law will take $3.5 billion out of the industry...for two reasons. First, larger companies won't be able to deduct as much of their intangible drilling costs. Second, most independent drillers will be caught by the minimum tax rates now."

Most economists don't foresee any dramatic upswing in oil prices that would resurrect the industry. The only bright spot is that natural gas supplies are coming down, which could spark some increase in drilling activity by the end of 1987.

The high technology sector of the economy is also anticipating a status quo year. However, the industry is nowhere near the depressed state of the oil, gas or basic manufacturing sectors.

California's Silicon Valley continues to reel from layoffs and cutbacks, with the semiconductor manufacturing industry particularly hard hit. But some larger companies like Hewlett-Packard see some potential improvement in 1987. "The electronics industry has faced...obstacles in the past two years which have led to an unaccustomed flat period of business results," said John Young, Hewlett-Packard's CEO and the past director of a presidential commission that studied U.S. economic competitiveness.

Mr. Young said some of the obstacles, such as the computer glut, low capital spending and customer uncertainty are being "worked through"; that could mean improvement in 1987. Hewlett-Packard, which has introduced several new manufacturing computers, expects "to follow the general trends of the industry in 1987 by showing a modest improvement in orders and revenue throughout the year."

Mr. Young said the key issues that will dominate the industry this year will involve the compatibility of different hardware, the networking of computers and the integration of communication into the office and manufacturing sectors. "If the business environment continues to improve—and we're fairly certain that this will occur—then Hewlett-Packard is well positioned to take advantage of the opportunity," Mr. Young noted.

Tax Reform: Automation Albatross?

The tax bill, in addition to reducing corporate taxes to 33 pct, eliminates the investment tax credit, which for some companies is a necessity to offset the cost of automation. It also contains a minimum corporate tax provision, using a second tax schedule—20 percent, less the benefit of such itemizations as accelerated depreciation and depletion, and a restructured accounting procedure for profit. Corporations then owe the greater of the two amounts.

For the industries cited as negatively affected by the new tax bill, the consequences may be irreversible. State officials have reported that as significant U.S. companies move offshore, foreign companies are quick to move in and take the place of the domestic counterpart in the community and the marketplace.

Booming Aerospace

The aerospace sector will continue to be one of the stronger economic sectors in 1987. Many of the major defense programs—the B-1 bomber, stealth fighter, C-17 cargo plane, as well as mainstay Air Force and Navy programs like the F-14, F-15 and F-16—continue on a major role.

Government funds also are flowing into the defense sector for continued research into President Reagan's Strategic Defense Initiative (Star Wars) and the Air Force's Advanced Tactical Fighter program, which aims to produce a new technology fighter jet for the 1990s.

The Commerce Department expects military aerospace exports to play a critical role in the economy. Exports may touch $3 billion by the end of 1987, compared to an estimated $2.6 billion in 1986. The principal weapons export continues to be fighter aircraft. Officials with the State and Defense Departments expect foreign military sales agreements to reach $12.5 billion in fiscal 1987, up from $12.05 billion in 1986.

The civilian aerospace sector also has been strong. Airframe manufacturers are coming off two good years, and sales are expected to be strong in 1987, but slightly lower than 1986.

The Douglas Aircraft Division of McDonnell Douglas Corp. is likely to officially launch its MD-11 program this year, a replacement jet for the DC-10. Employment is expected to rise since the company is also gearing up for production of the Air Force's new C-17 cargo plane.

Seattle-based Boeing Aircraft Co., the world's largest builder of commercial jets, foresees stable employment but a slight drop in new commercial orders caused by lower fuel prices that make replacement of older jets less desirable economically. Tourist travel, especially to Europe, also is down (affecting airline profitability) because of the weakening U.S. dollar. The trend has not yet been offset by larger numbers of foreigners traveling to the U.S.

"We've had a couple of good years back to back," said Tom Craig, Boeing's director of market research. "We feel it will be prudent to lower our expectations. The last two years have been above the general industry (sales) trend and we can't continue that forever."

Boeing sold 390 airplanes valued at $15 billion in 1985. Less than 350 jets were sold in 1986, but the dollar amount exceeded $18 billion because the company sold more expensive 747 jetliners.

"The near-term market is not very good because the (older) airplanes simply are not being retired," said Mr. Craig. "The cost of fuel has come down sufficiently so that the fuel burn penalty an airline is paying for flying old airplanes around is simply not that great."

Despite the difficulties, employment at Boeing should be stable in 1987. The company has an order backlog of $24 billion. Some 75 percent of this figure is in commercial aircraft and the rest in military orders.

CANADA

CANADIAN CONSUMER DEMAND AND investment strengthened throughout 1986, leading to an annual growth rate of 3.5 percent. However, a downturn in the energy sector, which had sparked earlier growth, reduced the total from 1985's gain of 4.5 percent.

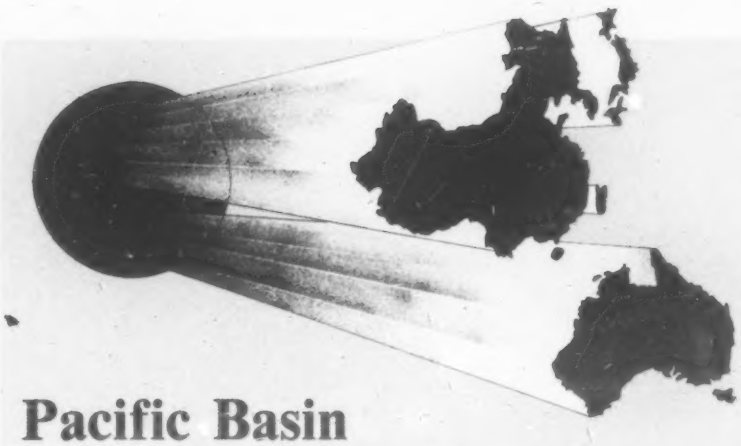
This rate of growth, however, was sufficient to keep U.S. shipments to Canada at near record levels: U.S. exports were seen topping out at about $46 billion for 1986, only two percent below the record set in 1985. The modest decline was found in mineral fuels/lubricants, manufactured goods, machinery and transportation equipment.

U.S. imports from Canada reached the $70-billion level last year, a rise of barely one percent; thus the merchandise trade deficit for 1986 was $17 billion. The largest U.S. import sectors were certain types of manufactured goods, chemicals, and in edible raw materials, not including fuel.

The U.S. trade deficit with Canada has increased each year, since 1981, when it was $2.8 billion. This is basically attributed to a stronger U.S. economy, to a shift in motor-vehicle trade and to the declining U.S.-Canada currency-exchange rate. The Canadian dollar sank from $.83 in 1981 to $.72 in 1986.

This has boosted Canadian exports while simultaneously making U.S. goods less competitive there. With no predictable appreciation of Canadian currency against the U.S. dollar, U.S. exporters are advised to emphasize the non-price advantages of their wares when marketing them in Canada.

Selective opportunities for increased U.S. sales in Canada reflect the country's favorable economic growth, powered by consumption and investment spending.



Pacific Basin

The steep appreciation of Japan's yen against the dollar will continue to impact the U.S. trade imbalance for 1987. U.S.-China trade in 1986 should exceed the 1985 record high of $8.1 billion, and the trend should hold in 1987. Korea remained the eighth largest U.S. export market last year, while America's trade deficit with Taiwan headed toward the $14-billion mark.

JAPAN

WHILE THE GROWTH OF THE HUGE U.S.-Japan trade deficit was slowed last year, the deficit was seen topping $55 billion by year's end (versus $50 billion in 1985). And the growing appreciation of the yen against the dollar should have a continuing impact on the trade imbalance.

The full, positive effects of exchange-rate changes—a decline in imports from Japan, growth in exports to Japan, and a reduction in the trade deficit—were expected to continue into 1987. Remember, the key words are a "reduction in growth" of the deficit, a slowing of the trend that had been building for years.

A deep decline in U.S. exports of aircraft and parts (always prone to cyclical swings, but seen likely to improve this year), plus falling corn and coal exports, led the overall dip in exports to Japan for 1986. And U.S. exports of many raw materials are likely to hold sluggish because of continuing downward trends in various commodity prices.

Last year, imports from Japan were once again fueled by strong growth in automobiles and other vehicles and spare parts, office machinery and computers. Last year's growth in imports moderated, for the first time in recent years, due mainly to the slowdown in the U.S. economy, as well as rising prices of Japan's wares because of the yen's appreciation.

The improved price-competitiveness of the weakened U.S. dollar has improved sales prospects for exports of a wide range of products from forest products to pharmaceuticals. But total U.S. exports to Japan will remain moderate until her domestic demand increases and wider market penetration is gained by American exporters.

Japan's consumption and import growth could be stimulated greatly if the full benefits of yen appreciation and cheaper oil were to be passed on to end-users. Deflationary effects of the yen's appreciation against the dollar were appearing early last year—Japan's GNP fell in the first quarter of 1986 by 0.5 percent, the first quarterly decline in 11 years.

That contraction was attributed basically to a dip in the growth of exports and slack domestic demand. Some private forecasters have lowered their predictions for fiscal year 1986 GNP growth, but Japan's government has not, at presstime, altered its official forecast of four percent real growth, signalling its confidence that the economy was headed for a rebound near the end of last year.

In April last year, a high-level private sector commission led by former Bank of Japan Governor Haruo Maekawa released a report prepared at the request of Prime Minister Nakasone. The report recommended steps to restructure the Japanese economy to make it less export-dependent and more domestic-demand oriented, thereby reducing the country's high currency-account surpluses.

CHINA

THE U.S. DEPARTMENT OF COMmerce predicted: "Slower economic growth, depressed crude oil prices, and tighter foreign-exchange controls are likely to restrain the expansion of Sino-U.S. trade in the last half of this year (1986)." Nonetheless, two-way trade was expected to top 1985's all-time high of $8.1 billion.

The actual figure for the first half of last year was $4.2 billion, exceeding the 1985 first-half trade by 15 percent. In that half, U.S. exports to China rose seven percent to $1.8 billion, while imports from China reached $2.4 billion, a hefty gain of 22 percent.

This trade growth occurred in a period of lackluster industrial growth in China; industrial production there in the first half grew 4.9 percent,

JAPAN

Gross Domestic Product (GDP): $1.3 Trillion (1985)
Exchange Rate: U.S. $ = 0.006 Yen

	'82	'83	'84	'85	'86	'87**
Foreign Trade* Billions of U.S. Dollars						
Imports	132	126	138	131	130	130
Exports	138	147	169	174	166	165
Trade Balance	+6	+21	+31	+50	+55	+53
Industrial Production Index-Mfg. Base 1980 = 100	101	101	104	125	124	126

95 105 115 125

Source: U.S. Commerce Department, Others
*Total Year
**Projections

CHINA

Gross Domestic Product (GDP): $278 Billion (1985)
Exchange Rate: U.S. $ = 3.7 Yuan

	'82	'83	'84	'85	'86	'87**
Foreign Trade* Billions of U.S. Dollars						
Imports	17.9	19.6	26.7	25.0	N/A	N/A
Exports	22.9	23.5	27.4	24.2	N/A	N/A
Trade Balance	+5.0	+3.9	+0.7	-1.1	N/A	N/A
Industrial Production Index-Mfg. Base 1980 = 100	107	118	136	150	162	164

90 120 158 170

Source: U.S. Commerce Department, Others
*Total Year
**Projections
N/A—Not Available

TAIWAN

Gross Domestic Product (GDP): $66.8 Billion (1985)
Exchange Rate: U.S. $ = 36.6 Taiwanese Dollars

	'82	'83	'84	'85	'86	'87**
Foreign Trade* Billions of U.S. Dollars						
Imports	19.2	20.3	22.0	25.8	30.2	31.1
Exports	22.2	25.1	30.5	34.0	38.8	39.2
Trade Balance	+3.0	+4.8	+8.5	+8.2	+8.3	+8.5
Industrial Production Index-Mfg. Base 1980 = 100	'82 103.8	117.21	131.57	134.5	138.0	140.1

100 115 130 140

Source: U.S. Commerce Department, Others
*Total Year
**Projections

compared to the same period in 1985. This, of course, contrasts sharply with the 23 percent growth rate scored there in the first half of 1985.

Slow growth in energy supplies was a key factor behind the industrial slowdown last year. During the first five months in 1986, coal production gained less than one percent; crude oil production was up only two percent, measured against the same period of 1985.

The consumer durables' sector, which boomed in 1985, cooled considerably in early 1986. The chemical and machine-building industries also lagged. The growth of China's overall foreign trade also slowed early in 1986, due in part to lower prices for its oil and agricultural exports and reduced imports of some capital goods and consumer durables. Unlike 1985, when China's imports grew much faster than exports, 1986 saw a more balanced growth in foreign trade.

Chinese customs' statistics for the first half of 1986 show that exports and imports rose 14.4 and 8.8 percent respectively over 1985. In contrast, 1985's imports zoomed over 54 percent, while imports gained only 4.7 percent.

In 1985, China's trade deficit touched a record $15 billion. Thus, her foreign-exchange reserve declined from $16.7 billion at the end of 1984 to $11.9 billion a year later. With a trade deficit for the first six months of 1986 of $6.5 billion, another serious deficit for the last full year was predicted.

Chinese officials have indicated that the country is likely to have significant deficits for the next few years. Such deficits and falling exchange reserves present a major challenge to China's leaders in their management of foreign exchange and trade.

In an effort to boost exports and reduce the deficits, China last year devalued the renminbi sharply against the U.S. dollar, the Japanese yen and the Hong Kong dollar. It also has begun tough controls on foreign-exchange expenditures and what are termed "luxury" imports.

The tempo of foreign investment in China moderated last year. For example, during 1985 about 1,300 equity joint-venture agreements and 1,500 cooperative venture agreements were signed. Also nearly 50 wholly-owned companies were established in China by foreign interests.

The amount of foreign investment pledged under the agreements and contracts for offshore oil development and compensation came to nearly $6 billion in 1985. During the first four months of 1986, agreements were signed for 72 equity joint ventures involving $230 million in foreign investment, some 150 cooperative ventures involving about $280 million in investment, and seven wholly-owned foreign enterprises with about $1.2 million invested.

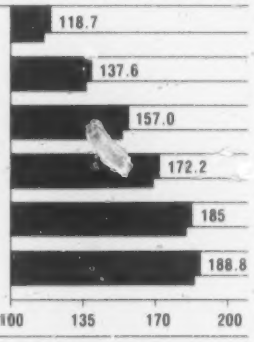
These foreign investments, as well as capital contributions pledged by foreign firms for joint oil development and compensation for that period, totaled only $600 million. That's a far cry from the pace of the preceding year.

That slower pace of foreign-investment growth in China last year resulted in part from a growing concern over China's foreign-exchange control policies and the rapid rise in business costs. Also contributing to the slowdown were a number of legal,

KOREA

Gross Domestic Product (GDP): $85 Billion (1985)
Exchange Rate: U.S. $ = 874 Won

	'82	'83	'84	'85	'86	'87**
Foreign Trade* Billions of U.S. Dollars						
Imports	24.2	26.1	30.6	29.2	30.7	32.8
Exports	21.8	24.4	29.2	29.0	35.1	36.2
Trade Balance	-2.4	-1.7	-1.4	-0.2	+1.7	+1.9

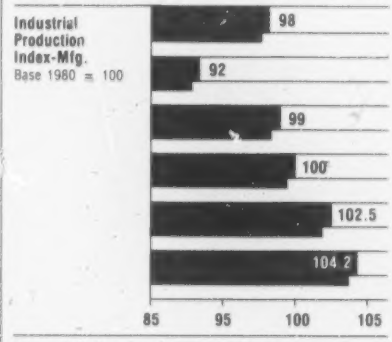


Source: U.S. Commerce Department, Others
*Total Year
**Projections

AUSTRALIA

Gross Domestic Product (GDP): $208 Billion (1985)
Exchange Rate: U.S. $ = 1.56 Australian Dollars

	'82	'83	'84	'85	'86	'87**
Foreign Trade* Billions of Australian Dollars						
Imports	22.9	21.6	27.0	30.1	34.7	36.2
Exports	20.4	21.6	25.7	29.5	32.8	33.1
Trade Balance	-2.5	0.0	-1.3	-0.6	0.8	0.6



Source: U.S. Commerce Department, Others
*Total Year
**Projections

regulatory and administrative uncertainties about doing business in that country.

TAIWAN

TAIWAN BURST AHEAD OF ITS SOMEwhat sluggish 1985 growth rate of 4.1 percent in the first quarter of last year with a much stronger 8.1 percent growth rate. This gain was the result of lower oil prices, declining interest rates and the depreciation of the NT (New Taiwan) dollar relative to most other foreign currencies.

These developments sparked exports and helped industrial production climb 7.5 percent. And this growth caused an increase in imports of raw materials and semi-finished products.

The lone dark cloud in Taiwan's bright picture for its economy is that inflationary pressures were seen mounting as the country's foreign-exchange reserves headed for record heights. These reserves in mid-1986 stood at $33 billion. But this inflationary pressure was considered unlikely to encourage accelerated removal of trade barriers in Taiwan.

The U.S. trade deficit with Taiwan for 1986 was tagged to increase to $14 billion. American exports were seen reaching for $5.2 billion by year's end. Since the NT dollar is pegged to the U.S. dollar, any devaluation of the U.S. dollar relative to other major currencies would make Taiwan exports even more competitive in America, while being just the opposite for U.S. exports to Taiwan.

Leading exports by the U.S. to Taiwan for the first half of 1986 included organic chemicals, oilseed and aircraft equipment. Where specific figures are available, impressive growth rates were also scored for electronic components (25.7 percent), telecommunications equipment (30 percent), hides and skins (105 percent), and synthetic resins, rubber and plastics (29.4 percent).

U.S. exporters were also predicted to do well in supplying chemicals and electric appliances, Taiwan's fastest growing global imports for 1986. Other strong exports are computerized business systems, industrial process controls, medical equipment, pollution controls, production and testing equipment, and consumer goods of a wide variety.

KOREA

KOREA, AS 1986 WOUND DOWN, HELD its position as the eighth largest export market for the U.S. and continued to provide excellent opportunities for exports and investments well into this year. Exports by the U.S. to Korea were anticipated to gain by about five percent, or for a total of $6 billion, over 1985.

The chief product sectors for strong U.S. export performance last year were electrical components and parts, electrical transmission equipment, organic chemicals, and leather and hides. Continuing growth in Korea's export industries created a demand for materials used to produce automobiles, electronics and semiconductors, to name some key industries.

After a relatively unimpressive showing in 1985, Korea's economy rebounded early in 1986 with a GNP growth of nearly 10 percent over the previous year. The full-year estimated growth was forecast to exceed eight percent. First-quarter investment rose more than 10 percent over 1985 levels; merchandise exports for the first third of 1986 zoomed by 22 percent ahead of 1985.

Korea anticipated a $1.7 billion trade surplus going into this year, compared to a $30 million deficit in 1985. This economic upturn can be related to three key factors that also hold for other Pacific Basin countries: declining oil prices, lower interest rates, and the depreciation of the Korean won against the Japanese yen.

Because Korea imports 100 percent of its oil, the drop in world prices has given a strong push to its economy. It has also benefited from lower interest rates, which have significantly trimmed Korea's debt-service payments. At $47 billion, Korea's foreign debt is the third highest among developing-country borrowers.

Korea's gains, in particular, have been assisted by its won's depreciation of more than 40 percent against the Japanese yen. This has significantly improved its competitive position against Japanese exports in world markets.

AUSTRALIA

AUSTRALIA, WHICH TABULATES ITS business years fiscally from July through June, had heady export and import gains for fiscal 1986 over 1985. Specifically, 1986 saw imports climb from A$29 billion last year to A$34.7 billion, of which imports from the U.S. reached A$7.3 billion from A$6.4 billion in 1985.

Exports to all countries rose similarly, the total being A$29.7 billion for 1985 and A$32.8 billion last year. U.S. exports faltered a bit, declining from A$3.5 billion in 1985 to A$3.3 billion in 1986. That gave the U.S. a positive trade balance of A$3.1 billion last year, down from A$3.8 billion in 1985.

Machinery was the import leader for 1986 at A$10.8 billion. Next were miscellaneous manufactured articles (A$4.7 billion), transport equipment (A$4.4 billion), chemicals/related products (A$3 billion), petroleum/petroleum products (A$1.9 billion) and manufacturers of metal (A$1.7 billion). The export leaders were coal/coke/briquettes at A$5.3 billion, metalliferous ores and metal scrap at A$4.9 billion. Next were cereals and cereal preparations (A$3.9 billion), textile fibers and waste (A$3.2 billion) and manufacturers of metal (A$2.7 billion).

Australia's imports have been increasing steadily since 1980 at a rate in the range of 20 percent (except for 1982-83 when there was a five percent decline). Exports have also gained in all years since 1980, but more in the range of three to 10 percent.

In the last 10 years, Australia's GDP has averaged a three percent gain in every year except 1982-83.

Western Europe

Strong economies are evident in Italy and Switzerland, while unempolyment haunts the UK and Spain. Deregulation, the free market approach and joint ventures are tools Western European countries have implemented, and will continue to use in 1987. Falling oil prices will contribute to economic difficulties in the region.

WEST GERMANY

ON THE WHOLE, 1986 HAS BEEN A good year for the West German economy. As predicted in our last year's survey, growth amounted to about 3.5 percent. Lower oil prices and, therefore, cheaper imports, fueled rising domestic demand. Inflation remained negligible—around one percent—and the year saw a slight decrease in unemployment to two million.

Nevertheless, the prestigious World Economic Institute of Kiel foresees some clouds on the horizon for 1987. Inflation is likely to rise and corporate profits fall as the benefits from lower oil prices become less marked.

One of the main influences on the West German economy is the rising value of the D-Mark relative to the U.S. dollar. This not only affects Germany's lucrative export trade with the U.S. but also makes it more difficult for Germany to sell goods in third countries where U.S. manufacturers compete. So far, the dollar has fallen no less than 37 percent against the D-Mark since its peak in early 1985.

Observers are saying that this situation makes it unlikely that Germany will use its huge trade surpluses—nearly $50 billion in 1986—to stimulate domestic growth and act as a locomotive for the world economy. Heinz Duerr, chief executive of AEG, the electrical giant taken over by Daimler-Benz last year, says growth in his own company has been held back by the dollar fall.

"So far, we have been able to adjust to currency swings by hedging contracts, but the possibilities for this will be less available in 1987," he noted. "The dollar fall is having a strong impact."

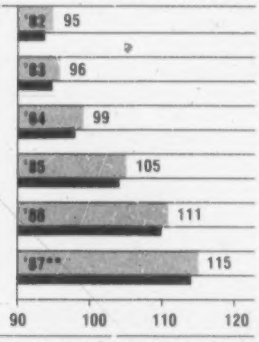
In the motor industry, VW expects its best year in 1986 since 1979 when it sold over 2.5 million vehicles. VW completed the takeover of Spain's only indigenous carmaker, Seat, during 1986 and this effectively swells the group's European output.

According to Mr. Schmidt, director for worldwide sales, the group

WEST GERMANY

Gross Domestic Product (GDP): $687 Billion
Exchange Rate: U.S. $ = 1.97 DM

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	110	113	117	123	125	127
Foreign Trade* Billions DM						
Imports	31	32	36	38	35	36
Exports	35	36	41	45	45	47
Trade Balance	+4	+4	+5	+7	+10	+11

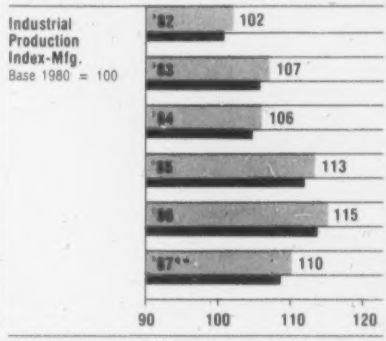


Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

UNITED KINGDOM

Gross Domestic Product (GDP): $460 Billion
Exchange Rate: U.S. $ = 1.43 Pounds

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	125	137	149	162	174	180
Foreign Trade* Billions Pounds						
Imports	4.7	5.5	6.5	7.1	7.0	7.7
Exports	4.6	5.0	5.8	6.5	6.3	6.5
Trade Balance	-0.1	-0.5	-0.7	-0.6	-0.7	-1.2



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

should push its world turnover up 10 percent in 1987. This will consolidate it as Europe's most successful car producer. Mr. Schmidt admitted that unfavorable publicity in the U.S. was affecting sales of the Audi 5000, but said that Audi was the only portion of the group that had capacity to spare.

VW's capital expenditure in the first half of 1986 jumped 60 percent compared with the same period of the previous year. The money was spent on new products and revamping factories... but not to increase capacity, only clear some bottlenecks. Mr. Schmidt said the company was engaged in talks with Ford about merging production facilities in Brazil.

There is still controversy in West Germany over the rising level of Japanese imports. Japanese carmakers now have 15 percent of the German car market compared with 11 percent in 1983. Hans-Erdmann Schoenbeck, president of the German automobile industry association (VDA), noted that most other European countries were restricting Japanese imports in one way or another and called on the Japanese "not to behave in such a way that would provoke protectionist defenses."

Mr. Schoenbeck said that so far the rising tide of Japanese cars had mainly affected other imports, but that German manufacturers were now increasingly being affected.

In machine tools, West Germany remains the world's leading exporter, with 65 percent of its output going to foreign customers. However, like other countries, Germany is suffering intense competition from the Far East. Currently, one third of the country's machinery requirement is being filled by imports, and there is a tendency for companies like Traub, one of Europe's leading turning center makers, to go increasingly upmarket to escape the competition.

It is interesting that at the two big machine tool shows of 1986, Hannover and Metav in Dusseldorf, there has been a heavy accent on new materials. Experts in Germany say traditional materials are being replaced at a fast rate.

For example, the use of plastics in the average car is expected to rise from 120 to 200 kg in the next five years and in manufacturing, there is an increasing trend towards the use of non-metallics in place of metals. Germany is aiming to take a leading role in new materials technology.

UNITED KINGDOM

MANY YEARS OF CONTRACTION HAVE left their mark on UK's mechanical engineering industry and, as the big manufacturing companies have shed labor, the biggest source of loss has been severance pay for redundant workers. This has cut profits but improved overall performance and many sectors are now healthier than people imagine.

An average of independent forecasts on the UK economy indicate that GDP grew 2.3 percent in 1986 and will grow by 2.6 percent in 1987. Inflation, however, which was running at just under three percent in the latter part of 1986, could climb to around 4.5 percent in the coming year.

Lower oil prices will make a significant dent in Britain's trading figures in 1987. Most forecasters expect that a surplus of 0.8 billion pounds on the balance of payments current account in 1986 will be turned into a 2.3 billion pound loss in 1987.

In the manufacturing sector, the first half of 1986 was disappointing, but the Confederation of British Industry (CBI) quarterly survey published in October 1986 suggested an upturn in the last half of the year. The CBI's economists now say that manufacturing output in 1986 will be one percent up on the previous year.

Unemployment still remains the biggest problem in the economy and the CBI survey did not take a cheerful view. "Industry will continue to shed labor over the next four months, with a drop of something like 8000 a month in manufacturing employment to January 1987," it said.

A survey by the London Business School predicts that mechanical en-

gineering in Britain will benefit from an upswing in world demand in 1987 (largely due to the effect of lower oil prices on non-oil-producing economies), and growth should accelerate to 4.75 percent in 1987. The School is particularly hopeful about productivity in Britain, which it says will improve by 4.5 percent in the coming year.

In the machine tool sector, 1986 has been a patchy year. As Ron Bull, president of the machine tool association puts it, "Some companies are doing reasonably well, while others are suffering a little. There is a decline in the UK market this time and we are in the throes of one of those downturns."

Mr. Bull says the U.S. and West Germany have been the two best markets for UK machine tools for some time, although China has come from nowhere to become the fifth most important sales area. All British exporters are making a big effort to sell to China, and the current historic visit by Mrs. Thatcher to the People's Republic should cement growing cooperation between the two countries.

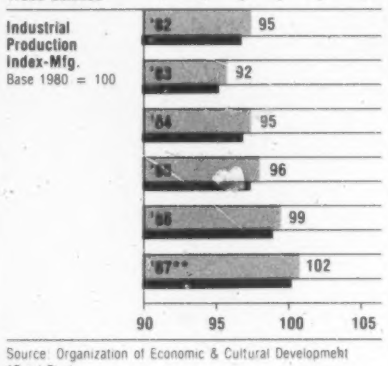
A reminder that rationalization is still underway has been the closure of TI Machine Tools plant in the North East with a concentration of activities in Coventry. The other major event has been the arrival of Yamazaki with the help of nearly $8 million worth of British government assistance. This has sent tremors of indignation through the industry and critics of the scheme say the Japanese company's output will hit a number of domestic builders. Yamazaki will begin making a range of small lathes and machining centers in Worcester and has already raised its output targets by 65 percent to over 700 a year.

An interesting development is the fight by some of the smaller British machining center makers against Japanese incursions. UK-made machining centers like Bridgeport, TI, Wadkin and Beaver now account for 40 percent of the home market compared with 25 percent four years ago.

FRANCE

Gross Domestic Product (GDP): $515 Billion
Exchange Rate: U.S. $ = 6.5 French Francs

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	137	155	168	178	186	194
Foreign Trade* Billions French Francs						
Imports	60	64	73	78	76	77
Exports	53	60	71	75	74	76
Trade Balance	-7	-4	-2	-3	-2	-1

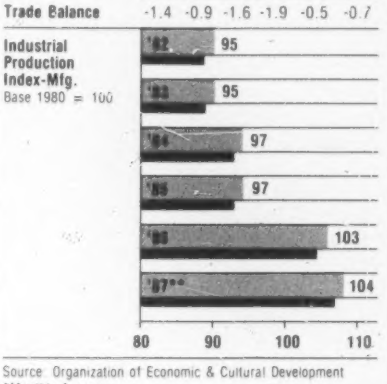


Source: Organization of Economic & Cultural Development
*Total Trade
**Projections

ITALY

Gross Domestic Product (GDP): $380 Billion (1986 Est.)
Exchange Rate: U.S. $ = 1,341 Lire

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	144	172	192	212	221	230
Foreign Trade* 1000 Billions Lire						
Imports	9.7	10.1	12.3	14.4	14	14.7
Exports	8.3	9.2	10.7	12.5	13.5	14.0
Trade Balance	-1.4	-0.9	-1.6	-1.9	-0.5	-0.7



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

The rise in value of the Yen is not helping Japanese machine tool sales, and there are signs that Japanese builders are changing their sales tactics to emphasize systems capability.

The on-going saga of the British motor industry continues. BL (now renamed Rover) has just announced a loss of nearly $150 million, so once again there is intense speculation about the future of the group. The big Nissan plant in Britain's northeast is now underway, and the Japanese carmaker has announced its intention to go ahead with the second phase of the operation to make 100,000 cars per year. This will certainly put pressure not only on Rover but also on the two U.S. multinationals, GM and Ford, who have been under persistent criticism for their imports of German- and Spanish-made cars into the UK.

Discounting these criticisms, Ford disclosed at the British motor show in October that it intended spending more than $2 billion in Britain in the next five years and that it would be making the UK the center of Ford's engine technology in Europe. Derek Barron, Ford's new chief executive in Britain, said the group had invested $2.4 billion in UK plants since 1979 and that the total capital stake now amounted to over $8 billion.

FRANCE

WHEN THE NEW FRENCH GOVERNMENT was elected in March 1986 its avowed aim was to introduce measures to make the country more competitive. It devalued the franc to help exports and announced reductions in business and profit taxes. It also set in motion controversial legislation to make it easier to shed labor.

The new government's free-market approach echoed Mrs. Thatcher's ideas in Britain. It lifted industrial price controls, announced widespread deregulation in energy and telecommunications, and set aboat the privatization of many banks and industrial groups. To help companies operating abroad, it eased substantially foreign exchange constraints.

Recently, M. Chirac, the new prime

minister, has shown some impatience that industry is not reacting swiftly enough to the batch of incentives. But what the new administration is finding is that the trouble goes deeper than can be dealt with easily by a series of rules and regulations.

Apart from the restructuring needed in industries like steel and shipbuilding—which have problems common to most European countries—and the big strides made in high-tech areas, many sectors of French industry lag behind their main competitors in profitability and investment. What they still have to face is the sort of bloodletting and rationalization that has gone on in Britain for nearly 10 years.

A recent report by the French employers federation shows that productive investment by French industry, both at home and abroad, is well behind those of its main rivals, the U.S., Germany and Britain. An indicator is the steady penetration of the French home market by foreign industrial products... from 27 percent in 1979 to 33 percent last year.

In machine tools, the restructuring mentioned in our last survey has continued. Government has admitted that it is looking at more Japanese involvement in the industry as a means of boosting domestic efficiency.

In the French motor industry, Peugeot is expected to make between $200 and $300 million profits in 1986, while Renault in the first half of the year was losing money at around $70 million a month. Renault is still striving to find a solution to its costly transatlantic assets, including AMC in the U.S. and an engine plant in Mexico.

The French steel industry is still, in terms of output per employee, one of the least successful in Europe, being behind both West Germany and the UK. Losses in the two state steel groups, Sacilor and Usinor, are forecast at $550 million in 1986, in the wake of a deficit of more than double that in 1985. French government has installed Francis Mer to mastermind French steel's return to profitability.

In aerospace, total orders doubled in 1985 to nearly $100 million compared with the previous year. Most of the French successes were in joint venture arrangements. Airbus—in which Aerospatiale has a 37.9 percent interest—had higher sales of 50 wide-bodied A300 and A310 jets last year as well as 39 confirmed orders for the new narrow-bodied A320. Thse orders will extend the company's workload well into the late 1980s.

Snecma, the French engine builder, has a joint venture with GE in the CFM-56 power unit. Jacque Benichou, Snecma's chairman, claims that orders have sped past the 2000 mark, and the total production run could be as high as 4000.

Exec Murder Shakes Business World

The murder of Georges Besse, chairman, Regie National des Usiness Renault, in Paris in November is still causing concern in boardrooms around the world.

Mr. Besse's personal involvement with any organizations, causes or groups that could explain his being the target seems nonexistent. His was a nonpolitical affiliation in an apolitical corporation in an international industry. In this country, insurance for directors and officers of any organization is already either costly or not available.

Now, some international companies will be wondering how to assess their risk and that of their officers and directors, and whether the risk is worth the exposure that might be required. There will be a variety of answers or measures used, but the incident will have a long-range impact on the ways some companies do business, in the opinion of more than a few executives.

ITALY

1986 PROVED TO BE A GOOD YEAR FOR Italy, with inflation falling to around six percent, economic growth at 2.8 percent and a substantial surplus on current account of around $3.5 billion as a result of the sharp drop in oil prices. Further growth in 1987 of three percent seems attainable, accompanied by a continuing drop in inflation to 4.5 percent and a current account surplus of $2.5 billion.

The signs of strength are unmistakable: record profits; the stock market at an all-time peak; relative industrial peace; and a spate of takeover operations in other countries.

In 1984 and 1985, there was an average rise of profitability in the private sector of the economy of 30-35 percent. Even Montedison, the chemicals giant which is Italy's second largest private group, moved firmly into the black after 11 years of making losses.

As for Fiat, the country's number one private company, things couldn't look rosier. In 1980, the group made a loss of 240 billion lira. By 1984, this had been turned into a net profit of 627 billion lira and in 1985 profits exceeded 1000 billion lira.

Fiat can claim a great deal of the credit for the restructuring of Italian industry, because that is what lies behind the resurgence. In 1980, the Fiat management won a power struggle with the unions and has never looked back. It blazed the trail for the rest of industry. Since 1980, the unions seem to have accepted that survival can only come through cooperation and long-term reforms.

With success at home, Italy's private groups have looked outward for profitable investments. Fiat's stake in Westland Helicopters; Olivetti's key purchase of 19.4 percent in the French motor components group, Valeo (formerly called Ferodo and incidentally a catalyst used by the French government to rationalize the French components industry); the acquisition by Feruzzi of Beghin Say in

France and its bid for British Sugar, all point to the vigor and growing stature of Italian finance and industry. In fact, so vigorous has Italian takeover activity been in France that some French industrialists are complaining of the "Italian colonization of French industry."

In the motor industry, the big news in Italy was the bid by Ford for Alfa Romeo, the country's number two carmaker. Following Ford's abortive talks with Fiat and then Austin Rover, the company saw logic in a merger with performance-oriented but unprofitable Alfa. However, the idea did not please Fiat. The Italian number one car producer's main secret of success is its dominance (56 percent) of the Italian market. The last thing it wanted was mighty Ford getting a foothold.

So Fiat came back with a counter-offer to take over Alfa Romeo and plans to merge it with its subsidiary, Lancia.

In steel, the privatization of part of the state steel industry's Cornigliano works near Genoa will put 80 percent of the Cogea bloom and billet works in private hands by 1988. Most important, this is seen as a possible model for a much wider restructuring of the country's state steel holdings. All over Europe, countries are followed the Thatcherite policy of privatization where feasible.

In the Italian machine tool industry—among the largest and most successful in Europe—there was a serious drop in home orders during the last quarter of 1985, and a spokesman for the industry said the outlook was not encouraging for 1986. This is surprising in view of the relative health of the manufacturing industry.

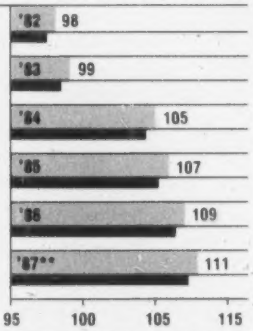
There is optimism regarding the status of Italian exports. Italian machine tool manufacturers like Mandelli and Comau have been pursuing vigorous export policies. At a time when domestic orders for Italian machine tools were down by 7.6 percent, during the whole of 1985 export orders showed a rise of 37.1 percent.

NETHERLANDS

Gross Domestic Product (GDP): $128 Billion
Exchange Rate: U.S. $ = 2.2 Guilders

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	110	113	114	120	121	123
Foreign Trade* Billions Guilders						
Imports	14.3	14.4	16.5	18.0	16.4	16.7
Exports	14.7	15.3	17.5	18.7	17.0	17.2
Trade Balance	+0.4	+0.9	+1.0	+0.7	+0.6	+0.5

Industrial Production Index-Mfg. Base 1980 = 100



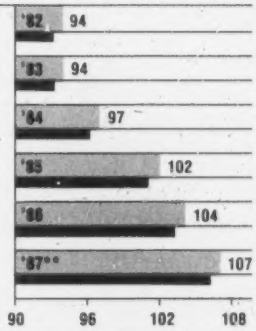
Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

SWITZERLAND

Gross Domestic Product (GDP): $103 Billion (1985)
Exchange Rate: U.S. $ = 1.62 Swiss Francs

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions Swiss Francs						
Imports	4.8	5.1	5.7	6.3	6.4	6.6
Exports	4.4	4.5	5.1	5.6	5.9	6.0
Trade Balance	-0.4	-0.6	-0.6	-0.7	-0.5	-0.6

Industrial Production Index-Mfg. Base 1980 = 100



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections
N/A—Not Available

SWITZERLAND

THE RECOVERY IN THE SWISS ECONOMY which started in 1983 is set to last possibly into 1987. This is longer than expected in earlier forecasts. A key stimulus has been the fall in the oil price. The fillip this has given to world demand has helped offset the effect on Swiss exports of the sharp appreciation in the Swiss currency over the last year—35 percent against the U.S. dollar.

A recent OECD survey could find no imbalances in the Swiss economy. This prompted one top Swiss economist to state that the Swiss economy "had no real problems." During 1986, inflation did not exceed two percent, and the country has a trifling one percent unemployment.

The Swiss engineering industry, badly hit by the recession of the early 1980s, saw a recovery in 1985 that continued into 1986. A mid-1986 survey by the Association of Machinery Manufacturers (VSM) among 200 of its top member companies—which account for the bulk of its output—revealed that the value of new orders rose 10.2 percent to a record level of $12 billion.

In machine tools, exports jumped 30 percent to a new record level of $1.25 billion. According to one authoritative source in Zurich, Switzerland is the most important foreign supplier of machine tools to Japan, amounting in 1985 to almost one-third of Japan's imports in value terms.

The outlook for 1987 is a stable economy, although the inflated value of the Swiss franc will hamper exporting operations, as the effects of falling oil prices will have lessened impact.

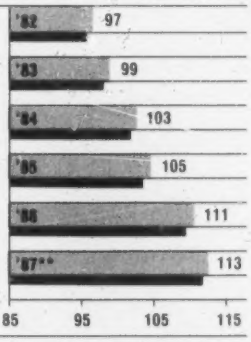
NETHERLANDS

GAS RICHES HAVE MADE THE NETHERlands a relatively wealthy country within Europe, but gas revenues have been falling lately and this, combined with an expensive welfare system, has created economic problems. The government has recently launched its toughest budget in three years.

BELGIUM

Gross Domestic Product (GDP): $88 Billion (1985)
Exchange Rate: U.S. $ = 41.0 Belgian Francs

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	117	124	130	134	136	139
Foreign Trade* Billions Belgian Francs						
Imports	221	235	266	276	258	260
Exports	199	220	248	263	261	263
Trade Balance	-22	-15	-18	-13	+3	+3

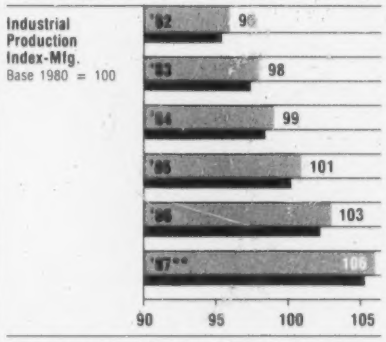


Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

SPAIN

Gross Domestic Product (GDP): $167 Billion (1985)
Exchange Rate: U.S. $ = 131 Pesetas

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	142	163	182	200	221	240
Foreign Trade* Billions Pesetas						
Imports	288	348	385	422	410	430
Exports	188	236	314	341	360	350
Trade Balance	-100	-112	-71	-81	-50	-80



Source: Organization of Economic & Cultural Development
*Total Trade
**Projections

Although industry is in far better shape than it was in the late 1970s and early 1980s, it has viewed the recent austerity measures with some dismay as the government has attempted to claw back lower gas revenues by imposing fresh taxes on companies. The employers federation (VNO) says the measures—which include a one percent increase in VAT and scaling back of tax allowances for inventories and capital assets—will add nearly $2 billion to industry's costs.

The government has countered by pointing out that lowered fuel prices have benefited industry to the tune of nearly $6 billion and some claw back is justified.

Industrial production growth is expected to remain flat through 1987 at around 2.25 percent. This is lower than 1986. The biggest decline is in investment growth, expected to be halved to 4.5 percent compared with the previous year, largely due to lower energy prices.

The investment reduction is due to some large refinery projects just being completed, while a number of big energy investments will be shelved because of the oil slump. The important machinery investment sector will be braked.

The energy sector's importance to the Netherlands is signalled by the Central Statistics Bureau's latest figures. These show an ominous eight percent decline in Dutch industry's total turnover in the first half of 1986. The economists say this reflected a slump of 52 percent in the oil industry and a drop of 19 percent for the chemical industry as a result of the oil price.

While lower oil costs are of benefit to industry, companies selling in the U.S. are suffering from the drop in the dollar relative to the guilder. At the recent Farnborough Air Show, a Dutch parliamentary delegation was told by one major U.S. defence contractor, Raytheon, that rising costs were endangering Dutch compensatory defense orders. Raytheon is supplying Patriot missiles tc the Netherlands and Dutch companies are contributing various components. Apparently, some component prices have risen 25 percent in the last nine months and are now considerably higher than U.S. competitors. The orders at risk are worth nearly $100 million.

Holland's biggest manufacturing company, Philips, has recently established a joint venture with two Japanese companies, Nippon Chemi-con and Nippon Steel, for the manufacture in Japan of ceramic electronic components. Products will include ceramic multilayer capacitors and be based on Philips' production and process technology. Initial production capacity will be a billion pieces per year.

In the motor industry, a fillip has been given to the economy by the coming on stream of Volvo's new small 480ES Saloon car. This is made at DAF's plant in Born, South Holland, and the product is largely aimed at the U.S. market. The plant employs state-of-the-art flexible manufacturing technology, including a great deal of robotic automation and what is claimed to be the most modern paint and finishing plant in the world.

A thriving motor components industry has been built around Born and DAF's heavy truck plant in Eindhoven. DAF is a survivor of Europe's heavy truck wars of the past 20 years, which have reduced the number of truck builders from 50 in 1960 to only 12 today.

SPAIN

SPAIN BECAME A FULL MEMBER OF THE European Economic Community (EEC) on January 1, 1986. By its population and economy, it ranks fifth among member nations, and in land area is second only to France. Where it is at a disadvantage with its neighbors is in unemployment (nearly three million, about 22 percent of the labor force) and inflation (now down to around eight percent but considerably higher than most of its fellow EEC members).

The country still has an adverse trade balance, but this has been

halved and the current account has moved into the black, mainly due to the enormous surplus on tourism. Big strides on industrialization have been made in recent years, and Spain has left behind its neighbor, Portugal. The country now has a thriving motor industry as a result of big investments in recent years from GM, Ford, Peugeot/Citroen and VW, and a growing machine tool industry beginning to rival the best in Europe.

The main industrial preoccupation is to improve quality and productivity. The latter is estimated by some experts to be 20 percent behind EEC standards. A common complaint from businessmen is concern for the rigid labor laws which make it difficult to shed workers. This dates from Franco's time when he withdrew union rights but bought peace with economic benefits.

Foreign investment in Spain has been running at a high level for some time. In April, work began at a $210 million factory near Madrid designed to make the latest in microchips. The plant belongs to AT&T. Although not the biggest single project Spain has ever had, it is significant and has been hailed as a pointer to the future. Charles Brown, AT&T's U.S. chairman, says it is "planting the seeds of advanced technology."

Spain was highly anxious to get the plant—which includes a computer-aided design center—and has agreed to put up an unprecedented 60 percent of the investment in the form of grants and soft loans. AT&T has agreed to train Spanish staff in the U.S., so the whole project represents a substantial gain in technology for Spain.

Other recent investments include a Corning Glass fiber optics plant—complete with its own R&D—a project by Kubota to make tractors through the farm equipment division of Nissan's subsidiary, Motor Iberica, and a spate of new investment by companies like Siemens, Pirelli and Ford. All these are connected to Spain's EEC membership.

The big news on the motor industry front is, of course, the takeover by Germany's Volkswagen of Seat, the indigenous Spanish carmaker. The Spanish government is putting up $1.2 billion to cover Seat's debts and set up the company on a satisfactory financial footing. Also planned is spending more than double this to modernize Seat's production facilities and raise production to 400,000 cars per year by 1990...25 percent more than at present.

BELGIUM

THE BELGIAN TRADE BALANCE MOVED into the black in 1986, mainly due to more profitable exports and weak domestic demand, which had the effect of holding back import growth after a peak in 1985. Underneath these good omens, however, there are deep concerns. One economist noted a crucial problem of low growth as a result of inadequate investment.

The OECD Economic Outlook published in mid-1986 touched on this when it said that business-fixed investment and inventory formation was weak, and not enough of the operating surpluses were going into new plants and equipment.

Another underlying worry is whether Belgian industry is making the right sort of goods for export. There is a concentration of effort, say the critics, on consumer products and not enough on chemicals, transport and machinery, all of which tend to be best sellers in Belgium's main overseas markets.

According to Fabrimetal, the mouthpiece for the Belgian manufacturing industry, such investment as is taking place in Belgium tends to be mostly by foreign companies established in the country. These are investing at twice the rate of indigenous firms. The largest sector is the automotive industry, almost solely foreign owned. Here, the scope for native technological innovation is inevitably limited. The plants—Ford, Volvo, Nissan and GM—are almost entirely assembly operations.

Both main regions of the country are heavily promoting high-tech investment. Flanders, the Flemish-speaking area in the north, attracted over $1 billion during 1984-85 and is concentrating on microelectronics. Under a joint university program 300 specialist electronic engineers are being trained every year. At Louvain, $46 million has been invested in an inter-university center where researchers from a number of Flemish universities can cooperate.

Similar programs are being developed in new materials, robotics, telematics, aerospace, automation and engineering.

Wallonia, the other main region of the country, meanwhile has singled out biotechnology and composite materials (as well as optics and robotics) for special support under its Athena program. Athena is designed to spur innovation through communication and selective financial assistance.

Wallonia has made strenuous efforts to persuade emerging U.S. companies to set up their European operations in Southern Belgium. So far, American firms which have taken the bait are Liposome of New Jersey, Bioassay of Woburn and the California-based Hybritech.

PORTUGAL

LIKE SPAIN, PORTUGAL JOINED THE EED during 1986 and so far things have gone well. The country feared a sharp rise in imports from other EEC members and economists were preparing for a current account deficit in 1986 after a surplus in 1985 for the first time since 1974. In the event, a combination of factors has ensured that the current account will remain satisfactorily in the black.

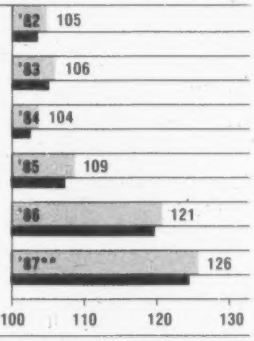
Lower oil prices are expected to save Portugal between $400 and $600 million in 1986. Reduced international interest rates and a lower dollar have helped the country's trade.

Growth is expected to accelerate from 2.4 percent in 1985 to four percent in 1986. Inflation has been

PORTUGAL

Gross Domestic Product (GDP): $20 Billion (1985)
Exchange Rate: U.S. $ = 145 Escudos

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	143	169	199	246	276	300
Foreign Trade* Billions Escudos						
Imports	63	74	96	108	107	115
Exports	28	42	63	80	87	91
Trade Balance	-35	-32	-33	-28	-20	-24

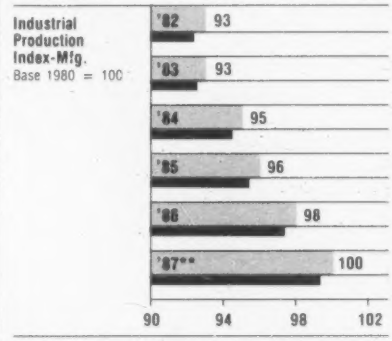


Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

GREECE

Gross Domestic Product (GDP): $41 Billion (1985)
Exchange Rate: U.S. $ = 142 Drachma

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	170	203	256	307	336	360
Foreign Trade* Billions Drachma						
Imports	56	70	90	117	121	123
Exports	24	33	45	52	67	69
Trade Balance	-32	-37	-45	-65	-54	-54



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

reduced from 19 percent in 1985 to under 12 percent in 1986. Mr. Miguel Cadilhe, the finance minister, hopes to reduce inflation to eight percent in 1987 and to reach average EEC rates by 1989. It would then be feasible for Portugal to join the European Monetary System.

In its efforts to reduce production costs, the government has cut internal interest rates to 5.5 percent in the last five months.

Foreign investment has been rising in dollar terms during the last two years at about 30 percent a year. Nevertheless, last year's foreign investment of $250 million is small beside the $3 billion which flowed into Spain. This is surprising since manufacturing costs are lower in Portugal than in some Asian countries, and unit labor costs are 40 percent of those in Spain. Recent political instability, rather archaic bureaucracy and a relatively small internal market have probably deterred would-be investors. But the longer-term outlook is good for investment.

U.S. companies have put more money into their Portuguese investments recently. Ford, which bitterly disappointed the Portuguese authorities when it shelved a major carmaking project a few years ago, is expected to sign a deal to produce a commercial pick-up for the European market. GM is negotiating a project for a third components factory that will create 500 jobs. Other projects include a Fiat plan to make car body parts, along with mechanical and electrical components, at its assembly plant in Portugal; and a Japanese components venture.

GREECE

IN RECENT YEARS, GREECE HAS BEEN dogged by high inflation (around 20-25 percent), a rising unemployment rate which reached 10 percent in 1986, sharply rising wage costs, a current account deficit of $3 billion in 1985, and somewhat less than that in 1986.

In late 1985, the government presented a package of economic stabilization measures aimed at cutting the current account deficit and reducing inflation. The program centered on devaluing the drachma by 15 percent, restricting a wide range of imports and controlling wage settlements.

The latter is probably the most controversial. As a result of price indexation, Greek wages have risen persistently faster than the OECD average. For instance, hourly pay rates in manufacturing rose by an annual average of 25.2 percent from 1973-83 and this trend continued in 1984-85.

From 1986, wages were for the first time not adjusted automatically to the price increases in the previous four months, but were restricted to 80 percent of the expected price increase in the first four months of the year. If this policy continues, say economists, wage increases in manufacturing could fall below 18 percent compared with an OECD average of 4.5 percent.

The import restrictions, which take the form of a cash deposit scheme, reduced the inflow of selected goods by $0.3 billion in the last quarter of 1985 and are aimed at slashing the imports of the goods covered by the bill by 25 percent in 1986. Significantly, the import restrictions do not apply to machine tools and other equipment needed by industry.

During a recent visit to the U.S., Greek economy minister Costas Simitis said he hoped to attract more American investment to the country.

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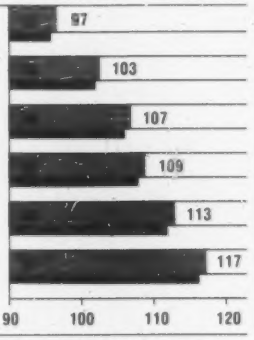
Scandinavia

Continuing problems are expected throughout the Scandinavian countries in dealing with wage costs. Sweden is faced with massive walkouts in the public sector, which threaten the entire economic recovery plan. Denmark has enjoyed four years of rapid growth, but will need to keep inflation in check during 1987. Steady growth has been realized in Finland, and diversification in industry is of paramount concern. Norway, already suffering from the wages issue, has been hit hard by falling oil prices and a serious devaluation of currency.

SWEDEN

Gross Domestic Product (GDP): $85 Billion (1986)
Exchange Rate: U.S. $ = 6.8 Swedish Kronor

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	118	127	141	154	162	181
Foreign Trade* Billions Danish Kronor						
Imports	14.5	16.7	18.2	20.4	18.0	18.4
Exports	14.0	16.7	20.2	21.7	22.0	22.7
Trade Balance	-0.5	0	-2.0	+1.3	+4.0	+4.3



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

SWEDEN

JUST AS ECONOMISTS WERE BREATHING a sigh of relief at the fall in oil prices and the better implications for the beleagured Swedish economy, strikes in the public sector have threatened the whole recovery program. At the time of writing, 17,000 public sector workers are out, another 600,000 have imposed an overtime ban and 175,000 postal, power station, railway, telephone and other workers seem about to do so.

A measure of the problem is that with Sweden's cradle-to-the-grave welfare system the public sector is bigger in proportion than that of any other industrial nation. Expenditure on the public sector as a percentage of the GDP rose from 24 percent in 1950 to over 65 percent in 1985. In the last two decades the public sector's share of the total workforce has jumped from 21 percent to 38 percent (774,000 to 1.6 million).

Nobody can predict how the present labor troubles will affect 1987. Certainly 1986 was not a bad year for Swedish industry. Output in the engineering sector rose six percent to total about $35 billion, and this corresponds with an increase of 10 percent the year before.

According to Anders Rune, chief economist of the Engineering Employers Federation, growth in the engineering sector will amount to four percent in 1986 but will fall to zero in 1987. In fact, 1987 will be "zero year" with stagnation in investment and production with a possible slight fall in employment. A phase of increased industrial investment in the U.S. is now over, says Mr. Rune, and demand for Swedish products there is bound to fall off.

Swedish/U.S. harmony is not helped by the anti-dumping suit filed recently by a group of U.S. steel producers against two Swedish specialty steelmakers, Avesta and Sandvik. This is the latest round in a bitter quarrel that has been rumbling on for some years. The recent petition is based on allegations that the Swedish government has subsidized the steel industry and this gives Swedish companies an unfair advantage in the U.S. market.

In machine tools, a drastic rationalization is occurring under the aegis of a state company called Machine Tool Invest. The company recently promoted a merger between SMT, the CNC lathe maker, and Sajo, which makes sophisticated machining centers. The idea has been pursued both in Italy and France and aims to put together complementary companies so that they can attack foreign markets more vigorously.

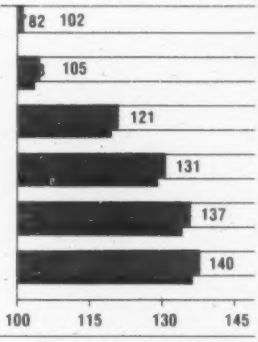
Many of the Swedish machine tool makers are small and the industry is fragmented. Further moves in this direction can be expected shortly.

In the motor industry, both Volvo and Saab were profitable in 1986, bucking the trend of the larger car producers in Europe. Volvo launched the 480ES, its first front-wheel-drive model, in mid-1986. The car is built at the old DAF factory at Born in the Netherlands. It is largely aimed at the U.S. market, where it will be introduced in 1987. Saab launched the 9000 turbo and fuel-injected models.

DENMARK

Gross Domestic Product (GDP): $56 Billion (1985)
Exchange Rate: U.S. $ = 7.43 Danish Kronor

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	120	128	134	141	146	150
Foreign Trade* Billions Danish Kronor						
Imports	11.6	12.4	14.3	15.6	16.3	16.6
Exports	10.5	12.2	12.7	14.9	15.0	15.5
Trade Balance	-1.1	-0.2	-1.6	-0.7	-1.3	-1.1

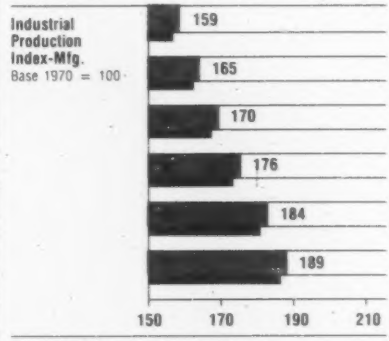


Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

FINLAND

Gross Domestic Product (GDP): $47 Billion (1984)
Exchange Rate: U.S. $ = 5.5 Finmarks

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	120	128	135	138	139	140
Foreign Trade* Billions Finmarks						
Imports	70	72	74	N/A	N/A	N/A
Exports	73	77	81	N/A	N/A	N/A
Trade Balance	+3	+5	+7			

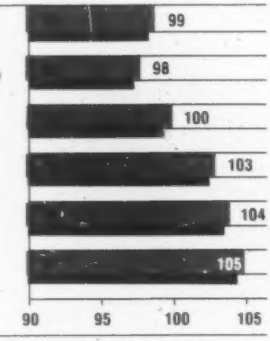


Source: Confederation of Finnish Industries
*Total Year
**Projections
N/A—Not Available

NORWAY

Gross Domestic Product (GDP): $65 Billion
Exchange Rate: U.S. $ = 7.25 Norwegian Kronor

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	121	132	143	154	164	172
Foreign Trade* Billions Norwegian Kronor						
Imports	8.3	8.2	9.4	11.1	12.3	12.5
Exports	9.4	10.9	12.8	14.2	12.2	12.5
Trade Balance	+1.1	+2.7	+3.4	+2.1	-0.1	0



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections

Both Swedish car producers are adding capacity and have been persuaded by the government to build factories in areas depressed by the demise of ship-building in recent years. Volvo has announced that it will build in Uddevalla, north of Gothenburg and Saab is to put a plant into Malmo, also on the east coast.

DENMARK

AFTER FOUR YEARS OF RAPID GROWTH, The Danish Economic Ministry forecast a setback in 1987, with GDP increasing by less than one percent and unemployment beginning to take an upward turn. This is a contrast to the Danish "economic miracle" which increased employment 11 percent since 1982 and cut unemployment from 11 percent to eight percent in the same period.

The slowdown will undoubtedly help the current account balance of deficit payments, which amounted to $4.5 billion in 1986. The economists say that this could drop to just over $3 billion in 1987.

Inflation has not been a serious problem in recent years in Denmark. The Economic Ministry says consumer prices rose by about 3.5 percent in 1986. But this could accelerate if wages are forced up by wage bargaining in the private and public sectors of the economy. Like other Nordic countries, wage costs are a perennial problem.

Industrial production expanded by 3.5 percent in 1985 and about the same in 1986.

FINLAND

THE STEADY IF UNSPECTACULAR growth of three percent a year which Finland has enjoyed over the last four years slowed in 1986 and will continue to decelerate in 1987. During this time span, the country has managed to keep unemployment well below average European levels. And, more significantly, inflation has dropped from over 12 to under three percent in December 1986.

Finland's main trading partner is the Soviet Union, which buys 21 percent of all Finland's exports and supplies a fifth of its imports. The fall in the oil price has caused an imbalance in Finnish/Soviet trade since the greater part of Finland's oil supplies come from the Soviet Union.

One of the fastest-growing of Finland's exports is engineering and metal goods, which grew by 25 percent from 1984-85. The country is trying hard to diversify from traditional industries like paper and pulp to high technology, and the government has set up the Finnish Technology Development Center to foster the creation of small high-tech companies. One of the Center's aims is to increase R&D spending from the present 1.4 to two percent of the GNP by 1990.

Finland has a thriving but small motor industry. This is a joint venture with Saab, and a third of all Saab cars are made at Saab Valmet's plant in Uusikaupunkki. Notably, the Saab 9000 Cabriolet, aimed primarily at the U.S., market is made by Valmet. The country also has over a hundred small-to-medium companies

supplying components to the motor industry—from plastic fuel tanks to mobile telephones and forgings and castings.

NORWAY

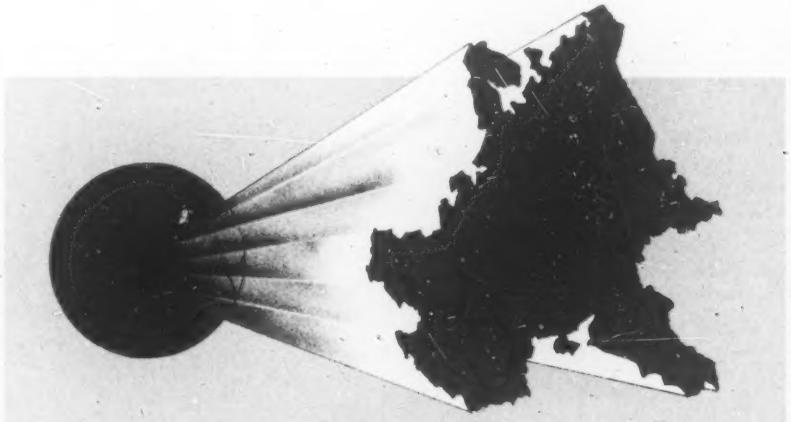
WITH FALLING OIL PRICES, NORWAY, which has relied heavily over the last decade on oil exports, has hit harder times. In 1986, the country ran a deficit over the first seven months of more than $2.5 billion. This compared with a surplus of roughly the same amount in the same period of 1985.

Government sources blamed the growing deficit on reduced earnings from the 900,000 barrels per day produced by Norway, and on a serious deterioration of traditional export industries. A wave of international speculation against the Norwegian krone forced a 12 percent devaluation of the currency during 1986, and the government has been forced to impose one of the toughest austerity packages for many years.

One of Norway's crucial problems is sharply rising wage costs. Many economists fear that with inflation rising and wage settlements still being made at levels above those of Norway's main trading partners, a second devaluation is inevitable in 1987 or 1988.

Even before the fall in oil prices, Norway's economy was overheating badly. During the last half of 1985, the GNP was expanding at an annual rate of eight percent, and towards the end of the year domestic consumption was rising at a rate of 9.5 percent a year.

The Norwegian metals industry is being restructured. During 1986, there was a significant shake-up in the ferro-alloys field and considerable rationalization in aluminium production. Industry is trying to move away from merely being a supplier of raw material and is adding value where possible. A big push has been made to become a components supplier to the European auto components industry.



Eastern Europe

Several Eastern European countries continue to struggle with their economies, and major reform in foreign trade has become a priority. Joint-venture agreements are being pursued throughout Comecon governments as a means to beef up technology, enhance product quality and maintain competitive pricing with the West. Despite the effects of the Chernobyl nuclear disaster in the Soviet Union, industrial growth exists.

COMECON

AT THE LATE 1986 SUMMIT MEETING, Comecon governments agreed to pursue intra-Comecon joint ventures in an effort to increase industrial cooperation. Soviet leader Mikhail Gorbachev wants to parallel the West in developing new technologies, and joint-ventures are one tool being used. All Comecon countries except East Germany have, or are about to introduce, legislation formalizing joint-venture agreements.

Earlier in 1986, Comecon adopted a 15-year plan to close the "technology gap." The program focused on electronics, robotics, new industrial materials, biotechnology and nuclear energy. Only in nuclear energy is Comecon roughly equal in development to the West.

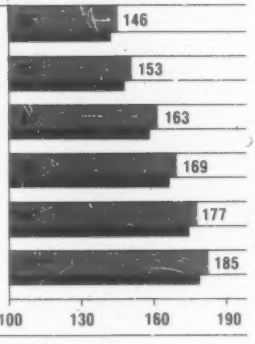
Comecon particularly wants to expand the flexible manufacturing system (FMS) and flexible cell concept, along with increasing use of robots, automatic process monitoring systems and control systems. The Paris-based Coordinating Committee (CoCom) has placed an embargo on robotic exports to the East, forcing the development of more concentrated high-tech industries in the East. Countries that have developed FMS capability include Czechoslovakia, East Germany and the Soviet Union. Hungary has a prototypical FMS under development. In addition, Poland and Bulgaria are active in flexible cells concepts, particularly those involving robot turning systems.

In computers, the U.S.S.R., East Germany, Czechoslovakia, Hungary and Bulgaria are very active. East Germany has been able to sell a few of its CNC systems into West Germany. A Swiss company is negotiating with Hungary over joint cooperation in developing CNC systems for turret punch presses, to be marketed in Eastern Europe and possibly Western Europe.

In addition to joint ventures, another major factor affecting East-West engineering trade is the dialogue between the European Economic

BULGARIA

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	1.9	1.8	2.3	2.6	2.7	2.8
Exports	1.2	1.0	1.1	1.2	1.3	1.4
Trade Balance	-0.7	-0.8	-1.2	-1.4	-1.4	-1.4
Industrial Production Index-Mfg. Base 1970 = 100	146	153	163	169	177	185



*Total Year (Western Industrial Countries)
**Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

Community (EEC) and Comecon over an outline agreement that would allow individual Comecon countries to seek bilateral trade agreements with the EEC. Any EEC-Comecon document would likely concern itself with general areas of cooperation in such fields as science, technology and the environment. Romania, Hungary and Czechoslovakia are actively seeking to conclude agreements with the EEC. Negotiating mandates are at present being discussed by the EEC Council of Ministers. If and when the mandates are approved, the EEC Commission itself will begin formal negotiations.

Both these moves are aimed at strengthening Comecon trade links with the West. Mr. Gorbachev is well aware that unless Comecon goods can compete in world markets in both quality and price, hard currency trade will decrease even further, threatening the economic stability of some East European countries.

ALBANIA

ALBANIA HAS SET THREE MAIN TASKS for the 1986-90 plan period: 1) develop industry, in particular mineral extraction and processing industry, along with engineering and chemicals, consumer goods and indigenous raw materials; 2) increase foreign trade; and 3) expand agriculture, primarily the production of bread grains and livestock products. The last five year plan (1981-85) failed to hit over-ambitious targets, and it is surprising that the leadership has again set high growth targets. The volume of industrial production by 1990 should grow 29-31 percent compared with 1985.

Energy development is to be a priority area. Major oil development will be from existing fields. The government intends to use new technologies to extend fields and increase well depths, both in existing sites and new developments. Secondary recovery methods will be used more during the plan period. Coal extraction is to increase and will be used to replace oil. More hydroelectric power stations are to be built.

Plans to increase mining include mining new minerals such as phosphorite, quartz, olivinte, rock salt, dolomits, magnesite, marble and bauxite. Some of these will be exported.

Steel sheet and copper production are expected to increase, as are chemicals and light industries.

Total investment during the plan period is estimated at 24-25 billion leks, with industry and agriculture accounting for the lion's share.

Foreign trade volume is expected to increase during the period by 33-35 percent with exports alone rising 43-45 percent. Imports are largely financed by exports of chrome ore (second largest exporter after South Africa), and Albania's policy of balancing imports and exports is likely to continue.

BULGARIA

BULGARIA'S ECONOMY IS BEGINNING TO improve. After weather-related problems in 1985 (severe winter followed by a drought), the economy began to improve, with gross output of socialized industry up 6.3 percent in the first half of 1986, compared with 3.6 percent in all 1985.

But this improvement is neither due to the economic reforms introduced by the Government nor better export performance. The real reasons are better weather and a good performance in agriculture. Moreover, considering the low level of growth in 1985, the results in 1986 are bound to look good.

Analysts, however, do not view the long-term Bulgarian economy with optimism. The country faces a massive hard currency (non-socialist) trade deficit, although it has managed to balance its rouble trade, particularly with the Soviet Union.

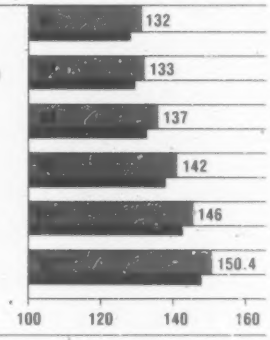
Industrial performance for the country, however, is a bit more difficult to analyze. The Government is not publishing as much information as in the past, particularly on the growth of electrical machinery and electronics output. These branches are the fastest growing (first six months of 1986 were up 18 percent over the same months of 1985).

According to some analysts, if the electrical engineering and electronics sectors continue their current growth pattern—almost twice the rate of non-electrical machinery and metalworking—before 1990 they will make up the second most important industrial branch and by the mid-1990s may be edging food processing out of top position.

The Government is pushing hard for this growth. By mid-year 1986, microcomputer output was up 130 percent, hard disks for microcomputers up 21 percent, and electronic telephone exchanges up 50 percent. In addition, there is a big effort to produce more NC machine tools and industrial robots. In the first half of 1986, output of modules for automated and mechanized machining lines was up 115 percent, output of NC machining centers rose 50 percent, and output of universal ma-

CZECHOSLOVAKIA

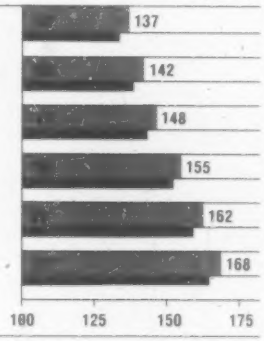
	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	2.9	3.0	3.7	4.0	4.2	4.2
Exports	2.8	2.9	3.2	3.3	3.0	3.0
Trade Balance	-0.1	-0.1	-0.5	-0.7	-1.2	-1.4
Industrial Production Index-Mfg. Base 1970 = 100	132	133	137	142	146	150.4



*Total Year (Western Industrial Countries)
**Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

EAST GERMANY (GDR)

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	5.0	6.0	7.9	7.9	7.3	7.0
Exports	6.0	5.9	6.6	6.0	6.0	6.0
Trade Balance	+1.0	-0.1	-1.3	-1.9	-1.3	-1.0
Industrial Production Index-Mfg. Base 1970 = 100	137	142	148	155	162	168



*Total Year **Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

chine tools increased 36 percent.

This impressive growth was due in part to Soviet reliance on Bulgarian parts. The U.S.S.R.'s demand for specific electronic machinery and peripherals, particularly for its defense sector, is guaranteed to keep the Bulgarian electronics sector booming.

Indeed, Bulgaria's future foreign trade profile is highly dependent on the Soviet Union, which supplies almost all of Bulgaria's raw materials and energy. In the 1986-90 period, bilateral trade turnover between the two is expected to increase by 40 percent.

CZECHOSLOVAKIA

MAJOR REFORM IN FOREIGN TRADE HAS been of prime concern for some time in Czechoslovakia. Such reform would include ending the monopoly of foreign trade by the Foreign Trade Ministry. The Foreign Trade "Bill" is supported by the prime minister, Lubomir Strougal. But sources in Prague claim no decisions are being made at the moment because of the uncertain political climate that continues to exist in Czechoslovakia.

The bill contains measures aimed at reorganizing foreign trade with Western countries, the allocation of hard currency, and the granting of import/export rights with Western countries. But a consensus to proceed with reform does not exist, and one official commented "the political will doesn't exist either." After 17 years of rule under President and Party Leader Gustav Husak, the ability of the Czechoslovak government to make decisions—economic and political—has diminished.

Czechoslovakia's engineering industry recorded an increase in production of 28 percent against the planned 25 percent for 1981-85. Exports to socialist countries went up 55 percent (the plan was for an increase of only 39 percent). The Foreign Trade Ministry had high hopes for engineering exports in 1986, and exports to socialists countries were to be based on long-term trade agreements and annual goods exchange protocols. The Soviet Union will remain Czechoslovakia's number one trade partner, but many problems must be overcome if exports to the West are to increase. According to the Federal Minister of Metallurgy and Heavy Engineering, Eduard Saul; Czechoslovakia plans to close down 17 obsolete steel rolling lines by 1995. This is a modest move, given the scale of the problem.

EAST GERMANY

WITHIN COMECON, EAST GERMANY'S economy is still the most buoyant. Unlike its socialist neighbors, the country sees no need for further economic reforms. Its system of "kombinates"—control of the entire production process, from raw material through to sales—appears to be well-suited to the ordered German style of management and government.

But this system also means a stifled economy. Innovative development is slower. Also, the introduction of any private enterprise element or any other economic mechanism for production is very unlikely under the current system.

Although the Government appears to have no intention of shifting more of its trade toward the West, it is now in a position to buy more, particularly if Western companies can offer their East German partners some real benefits. East Germany could be a good entrance into the rest of the Comecon market. It is clear that the foreign trade policy during this plan period (1986-90) will be much more mixed, particularly as long as there are no financial crises that would force East Germany to retreat to the safe economic arms of East-West German trade.

In the 1981-85 period the emphasis was on output of machine tools and agricultural machinery, both of which are good export items. This emphasis on engineering development continued in 1986. In the first six months of the year, East Germany produced 14,938 industrial robots (more than any other Comecon country), increasing overall output by 17 percent. By the end of 1986 the coun-

try hoped to have 73,000 robots in operation.

At mid-year 1986 East Germany's economy was right on course. Net material product produced (equivalent to Western GNP minus services) increased 4.3 percent over the 1985 period. Net output of industry in general was up 8.6 percent for the period. The good half-year results were due to increased production of new technologies. Substantial growth was seen in microelectronics, CAD/CAM technology, computers, and robots. East Germany is the Comecon leader in CAD/CAM technology, but falls behind the West in comparison.

HUNGARY

HUNGARY CONTINUES TO BE THE MOST daring of the economic reformists in Eastern Europe. Despite poor performance, bad weather (which affected food exports), and declining industrial growth, Hungary's government has not abandoned its movement toward a more market-oriented economy.

In 1986, government laws liberalized banking by allowing bankruptcy and legalizing unemployment. Five new banks are being introduced, effectively ending the monopoly position of the National Bank. In terms of Comecon economies, these are radical proposals. Coupled with the previous reform measures, including the breaking up of the foreign trade monopolies and delegating import/export rights direct to the enterprise, Hungary has progressed more than its Comecon neighbors.

So far, it appears that Hungary's flirtation with Western concepts of economics is being tolerated by Moscow. Indeed, Soviet Leader Gorbachev has publicly blessed the Hungarian reforms and is interested in applying some of them to his own faltering economy.

Despite Hungary's good intentions, however, the economy is in poor shape. Industrial growth in 1986 was not as high as had been expected.

HUNGARY

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	3.3	3.2	3.6	3.8	4.3	4.4
Exports	2.8	2.9	3.7	3.5	3.1	3.2
Trade Balance	-0.5	-0.3	-0.1	-0.3	-1.2	-1.2
Industrial Production Index-Mfg. Base 1970 = 100	124	125	128	129	130.5	132.5

100 115 130 145

*Total Year **Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

POLAND

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	3.1	2.8	3.4	3.7	4.1	4.3
Exports	3.6	3.6	4.0	3.9	3.8	3.7
Trade Balance	+0.5	+0.8	+0.6	+0.2	-0.3	-0.6
Industrial Production Index-Mfg. Base 1970 = 100	108	115	121	126.5	129	133

90 105 120 135

*Total Year (Western Industrial Countries)
**Projections N/A—Not Available
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986

Another setback was poor export performance, which has led to questions over the hard currency current account position. Peter Medgyessi, Deputy Finance Minister, says the country lost $550 million worth of exports in 1986 as a result of the fall in the price of oil, decreases in agricultural product prices and a drought. Although he would not forecast a deficit for the year, Mr. Medgyessi said it seems almost certain that 1986 will end the run of dollar surpluses recorded since 1981. The deficit at the end of August, 1986 was $584 million compared with $152 million in 1985.

The foundation of the 1986-90 electronics development plan is price reduction, customs regulations and tax cuts. The aim is to encourage the introduction of advanced technology. A credit policy to encourage the use of flexible production systems, robots and computerized plotting systems is also to be introduced.

Research is planned to develop new generations of small computers, computer networks, standardized software systems, electronic exchanges and cheap mass information systems. Fifth generation integrated digital telecommunications systems are also to be implemented. Enhancements in technology are being sought for the component industry.

Hungary plans to increase production 80 percent by 1990. The goal is to meet at least half of domestic demand plus increase exports through a series of cooperative agreements with Comecon partners and license purchases from the West. Small series products and sophisticated components will continue to be imported from the West.

POLAND

IN 1986, POLAND WAS ADMITTED INTO the International Monetary Fund (IMF). Membership in IMF is widely seen as the first step along the road to economic stability. Now Poland can, at least in theory, borrow up to $3 billion from the IMF. More realistically, however, the country could hope for IMF credits of around $2 billion over the next few years.

Finance Minister Stanislaw Nieckarz

ROMANIA

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	1.9	2.0	3.0	2.3	2.8	3.0
Exports	3.4	2.5	2.8	1.3	2.0	2.4
Trade Balance	+1.4	-0.4	-0.1	-1.0	-0.8	-0.6
Industrial Production Index-Mfg. Base 1970 = 100	163	171	182	135	138	141

125 150 175 200

*Total Year **Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

U.S.S.R.

	'82	'83	'84	'85	'86*	'87**
Wage Costs-Mfg. Base 1980 = 100	N/A	N/A	N/A	N/A	N/A	N/A
Foreign Trade* Billions U.S. Dollars						
Imports	26.3	31.5	33.5	33.4	27.6	26
Exports	26.1	27.0	27.5	23.9	22.8	23
Trade Balance	-0.2	-4.5	-8.0	-9.5	-4.8	-3.0
Industrial Production Index-Mfg. Base 1970 = 100	164	169	174	176.1	183	191.4

140 160 180 200

*Total Year **Projections
Source: First Austrian Bank
Economic Survey of CMEA Economics, Autumn 1986
N/A—Not Available

stated in March 1986 that Poland's foreign debt totaled $31.2 billion. That is $2 billion more than at the end of 1985, and is the result of the dollar's fall against other Western currencies. Mr. Nieckarz claimed that annual revenue from exports totaled only $6.2 billion, the lowest per capita exports in Europe.

Poland's trade surplus in 1986 is likely to be only $1.3 billion, well below the planned $5 billion. According to Januz Kaczurba, Vice-Minister of Foreign Trade, at then end of July, the surplus amounted to only $453 million as compared to $597 million at the same point of 1985.

The August trade figures were not, however, an unmitigated disaster. Preliminary estimates show engineering exports to the West increasing in volume by around 2.5 percent during the year.

If this is so, there will be celebrations in Warsaw where engineering exports performance has been the bane of the planners' life since martial law. Each year these exports to the West have dropped, while officials have said that with raw materials exports at a ceiling, engineering must spearhead the export drive.

Meanwhile, the Government has indicated it will continue to use the economic policies known as "operational programs" and "government contracts." Although both policy instruments encompass only domestic companies, they are of interest to Western companies. There is some value in knowing which areas of production are going to be favored by the Government when it comes to spending hard currency.

For 1987 both schemes have been allocated a total of $597.5 million. With the total value of imports from the West probably held at no more than $4.8 billion in 1987, it is obvious that the two schemes are likely to account for merely 13 percent of all imports.

ROMANIA

ROMANIA'S ECONOMIC DECLINE CONtinues. After a seemingly good performance in 1981-83 and part of 1984, the economy slipped badly. Poor weather conditions, bad management, lack of industrial expansion, little modernization, and depleting hard currency are contributing factors in Romania's struggle.

The hard currency trade surplus fell from $2.2 billion in 1984 to only $1.4 billion in 1985, and in 1986, it was expected to drop even further. At the same time, Romania has followed a course of repayment, which has starved the country's industries of new money and investment.

In 1985 machinery exports to both socialist and non-socialist countries fell substantially, and exporting to its own Comecon partners has become a battle for Romania. Some steel product exports have been redirected to socialist countries as a result.

Meanwhile, machinery imports stagnated, although there was a small increase in imports from the West. These, however, were mainly spare parts and components for previously imported equipment.

The economic performance of 1986 was poor, and official statistics on Romania were more vague that in the past. Romania reported an industrial growth rate in 1985 of 4.9 percent—one of the best results in Eastern Europe. But overall performance of the economy has lead analysts to conclude that this was a highly-inflated assessment, contradicted by individual analyses. Despite this track record, Romania insisted on setting impossible growth targets for 1986, which, as expected, were not met.

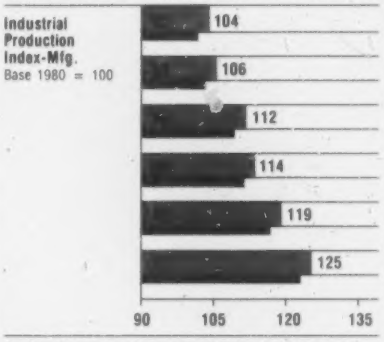
SOVIET UNION

DURING 1986, THERE WERE TWO MAjor changes in Soviet attitudes towards industrial policy that spell good news for Western companies. First, Mikhail Gorbachev announced a major reoganization of the Foreign Trade Ministry, in an effort to increase Soviet exports of manufactured goods and improve the use of imports. Second, the Government is also to give trade rights with the West to 21 ministries and 67 enterprises,

YUGOSLAVIA

Gross Domestic Product (GDP): $54 Billion (1984 Est.)
Exchange Rate: U.S. $ = 296 Dinars

	'82	'83	'84	'85	'86	'87**
Wage Costs-Mfg. Base 1980 = 100	175	223	324	573	1047	N/A
Foreign Trade* Billions Dinars						
Imports	57	96	156	277	320	N/A
Exports	44	78	133	244	300	N/A
Trade Balance	-13	-18	-23	-33	-20	N/A



Source: Organization of Economic & Cultural Development
*Monthly Average
**Projections
N/A—Not Available

beginning January 1, 1987.

According to Boris Balmont, Minister of Machine Tools and Instrument-Making Industry, 33,870 industrial robots of different types were manufactured in the U.S.S.R. between 1981-84. The emphasis for 1986-90 is to "considerably speed up" the production of industrial robots. Research, design and robotics education will cooperate closely with industry and is in line with strategies adopted by all CMEA states in recent months.

Soviet industrial robots in full-scale production include conveying and handling robots for fetching and mounting of blanks and removal of finished products, and process robots for painting, welding, assembling and precision cutting. At the Dynamo works in Moscow, for example, there are 16 systems serviced by UM-160, SM-40 and M-20 Soviet-made industrial robots. The goal is to incorporate robotics in 80 percent of all machine operations at the plant by the end of the 1980s.

Despite the effects of the Chernobyl nuclear disaster, industrial growth in the first half of 1986 rose 5.6 percent over the previous period. Machine building recorded an eight percent increase, and robot production rose 25 percent.

YUGOSLAVIA

INFLATION CONTINUES TO BE Yugoslavia's main problem, continuing at a rate of 80 percent a year.

In industry, there is a noticeable trend to higher technology products. In the small but growing machine tool sector there is a switch to making NC, CNC and flexible systems. The country has even embarked on robotics.

The so-called metals sector of the economy which includes manufacturing and engineering accounts for some 40 percent of the country's exports and amounted in 1985 to $4 billion. Exports in this sector were double the imports, and over half were paid for in hard currencies.

In power generating equipment, great strides in technology have been made in the last few years. The country can now supply generators up to 300 Mw and turbines to 500 Mw for thermopower plants. The same is true of the manufacturing of processing plants for chemical and other industries. The country's big enterprises are increasingly capable of manufacturing sophisticated equipment and whole factories, either alone or in cooperation with firms abroad.

Yugoslavia's growing automotive industry, represented by carmaker Crvena Zastava, has ambitious plans to export $1.5 billion worth of cars and spare parts to the U.S. alone by 1990. Plans are in hand to invest $500 million in production and other facilities.

However, Zastava complains that financial support for exporters is lacking in Yugoslavia. Dr. Radoljub Micic, Zastava's president, said the danger is that Far Eastern and European competitors will step in to win bigger shares of the U.S. small car market. P

The preceding coverage of World Outlook '87 was contributed by several sources, and credits are as follows: Al Senia, United States; Jim Dixon, Canada and the Pacific Basin; Peter Mullins, Western Europe, Scandinavia and Yugoslavia; Michael Page, Eastern Europe.

If you would like an additional copy of this article, please write on company letterhead to PRODUCTION, 6600 Clough Pike, Cincinnati, Ohio 45244-4090.

Capital Spending Outlook: 1987

Overall, 1987 looks like a repeat of 1986. Purchases of assembly equipment and gaging-inspection-testing equipment are the exceptions.

By Edward D. McCallum, Jr.
*Market Research Consultant**

WHILE SLIGHTLY OVER HALF (53.1%) of those responding to PRODUCTION's 19th annual survey of capital investment intentions plan to operate at higher levels of capacity utilization in 1987, only 35% plan to increase their plant's capital spending over 1986, continuing the downward trend of the last few years. Fewer respondents report an increase in orders; more report incoming orders decreasing and fewer had optimistic forecasts than we reported last year. These conditions bear heavily on the overall dollar forecast, which we project to nearly match 1986.

TABLE I

Spending Profile Based on Plant Size

No. Of Employees	Machinery/ Equipment Expenditures
less than 50	$160,000
50-99	$518,000
100-499	$630,000
500-999	$937,000
1,000 or more	$2,100,000

Based on the survey**, capital equipment requests will reach $10.5 billion for 1987. However, respondents report they *expected approvals* on only $8.15 billion for machinery-equipment investments. This is the figure used for all projections.

Using the $8.15 billion projection, capital investment for production equipment purchases are as follows:

- Metalcutting machine tools, $3.128 billion. Approximately $1.528 billion of this amount will be sourced domestically, representing 48.8% of this type of equipment purchased.
- Assembly equipment—$1.181 billion.

TABLE II

Robots: Current and Future Use

Application	Current Use (% of Respondents)	Plan to Use (% of Respondents)
Arc welding	11.7	14.7
Spot welding	5.6	5.8
Assembly	20.9	28.0
Loan/unload	27.4	34.8
Material handling	15.5	25.4
Spray paint	8.5	10.5
Other	2.8	3.2

Base: Respondents planning robot purchases during 1987-89.

- Metalforming equipment—$1.003 billion. $577 million will be sourced domestically, representing 57.5% of these purchases.
- Gaging-inspection-testing equipment—$692 million.
- Cleaning-finishing equipment—$554 million.
- Material handling equipment—$415 million.
- Welding equipment—$318 million.
- Plastic molding equipment—$236 million (captive market).
- Heat processing equipment—$163 million.

TABLE III

Computer Installations

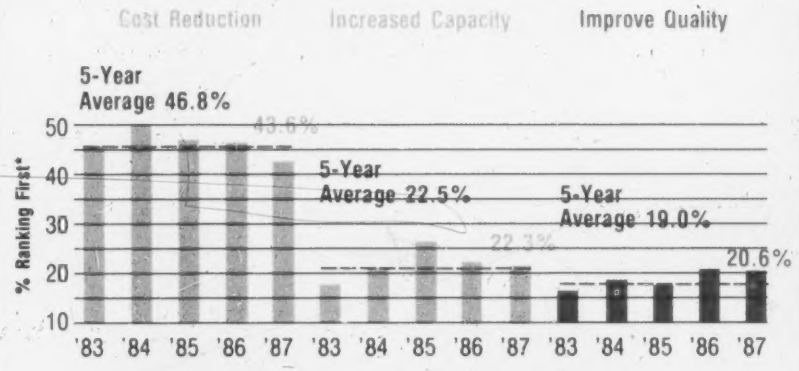
Application	Plan to Use (% of Respondents)
Shop floor control	33.3
Machine loading	29.4
Maintenance scheduling	28.5
CAD/CAM	27.1
Material requirement planning	25.5
Production control/scheduling	22.5

Base: Respondents planning computer installation during 1987-89.

*Mr. McCallum has conducted this survey for the last 19 years. He is a vice president of Indumar, Inc., a Cincinnati-based marketing research/consulting firm.

**Survey Scope: Plants reached by PRODUCTION Magazine in Fabricated Metal Products (SIC 34); Machinery, except Electrical (SIC 35); Electrical Machinery (SIC 36); Transportation Equipment (SIC 37); and Instruments (SIC 38). 1987 figures are projected from 1706 respondents from 11,500 plants contacted in keeping with past procedures.

Overall Motives for Planned Machinery/Equipment Investments



*Some respondents ranked more than one motive first.
Source: PRODUCTION's Capital Spending Forecasts 1983-1987

Cost reduction continues as the primary motive to buy equipment. The need to increase capacity remains the second most important motive; however, quality improvement, reflecting the users' need to make more good parts, is a close third. Other motives not graphed include: new products/models with 16.0 percent ranking first; machine/process flexibility—10.0 percent ranking first and trending upward over the last three years; make versus buy—6.0 percent ranking first and continuing a five-year downward trend which reflects large plant outsourcing; followed by energy reduction—ranked first by only 1.9 percent of the respondents.

To Last Year's Survey Respondents...

Thank you. You really are good forecasters!

The most immediate check on the accuracy of our projection is to check that share accounted for by metalcutting and metalforming machine tools. These segments account for about 50% of production machinery/equipment purchases, and information is updated monthly by the National Machine Tool Builder's Association and the U.S. Department of Commerce.

It now looks like our combined metalcutting and metalforming (Metalforming machinery) projection for 1986 will be off about 4.2%. PRODUCTION was low in its projection, in both categories. While we'll come within 1% on the metalcutting projection, there was a swing of $300 million from our domestic-sourced projection to the offshore suppliers.

Thanks for your interest and help!

The Overall Spending Profile

The typical plant profile for 1987 spending is shown in Table I on the preceding page. Plant spending, as reported by size of employment, differs radically from previous surveys. Respondents in larger plants—500 plus employees—report large cuts in spending, while those plants employing 50-500 persons reported substantial increases. This development helped to confirm the very real effort of larger plants to outsource many of the components they used to build in-house and place the fabricating and processing responsibilities squarely on the shoulders of the contract suppliers.

Other Highlights

- Plants were operating at 75% of capacity in August and September of 1986, down slightly from the same period one year ago.
- 34% reported having approved 1987 budgets, while another 45% expected to have approval by the end of 1986. It is noteworthy that the 45% awaiting approval expect to obtain only 67% of the funds they are asking for. Only 8% of 1987 budget equipment dollars have been placed with equipment suppliers. This has been the case for the last few years and underlines both the smaller backlogs of the equipment builders and the efforts of these builders to shorten delivery times.
- Nearly 50% of the total respondents will purchase a portion of their needed equipment from off-shore suppliers. The breakdown is: 52.9% in metalcutting; 16.3% in gaging-inspection-testing; 15.0% in metalforming. Why off-shore? 71.2% said equipment quality, 68.5% said price, 40.3% said availability, and 24.3% said service.
- While almost two out of three respondents (63.1%) use CNC equipment, less than half (48.5%) plan CNC equipment purchases over the next three years—down from 56.7% one year ago. Respondents' plants employing less than 50 persons averaged two CNC machines. Those eploying 50-99 averaged three units; those with 100-499 employees, six; 500-999, 10; 1000 or more employees, 18 CNC machines. As in past years, vertical and horizontal machining centers and horizontal turning machines account for the majority of CNC equipment purchases, by type.
- 10.7% of the total respondents plan EDM purchases during 1987-89 with about half of these plants buying their initial EDM machine. Wire

How the 1987 Capital Equipment Dollar Will Be Spent

** $1,528 million (48.8 percent) to be sourced domestically*

*** $426 million (57.5 percent) to be sourced domestically*

Pct of Total Investment—1987	Projection (Millions of $)	Change in Projection 1987/1986 (Pct of $)	Machines/Equipment
38.4	3,128*	-3.6	Metalcutting Machines
14.5	1,118	+ 22.9	Assembly Machines/Equipment
12.3	1,003**	+ 6.3	Metalforming Equipment
8.5	692	+ 14.2	Gaging/Inspection Testing
6.8	554	+ 1.3	Cleaning/Finishing Equipment
5.1	415	-5.3	Material Handling Equipment
3.9	318	-5.6	Welding/Riveting/Brazing Equipment
2.9	236	+ 7.8	Plastic Molding Equipment
2.0	163	-3.0	Heat Processing Equipment
5.4	440	-45.7	Other

machines will run about two to one over RAM (standard) machines over the next three years. 21.7% of the respondents now use EDM.

• Cost reduction targets reported by respondents were ranked in the following order: direct labor (always first), materials cost, in-process inventory, scrap rework (quality), indirect labor and perishable tools/supplies.

Planned Uses of Advanced Manufacturing Technologies

Manufacturing cells. 15.6% of respondents plan to purchase manufacturing cells during 1987-89. A cell is defined as comprising one materials handling device servicing multiple machines that are coordinated and paced by a computer or programmable controller. (NOTE: Cells can be machining-oriented, forming-oriented, assembly-oriented, etc.) Of those planning to purchase cells, 45% report they currently operate cells; 92.9% are located in plants employing 100 or more persons (half in plants of 500 or more), and the median 1987 capital investment for these buyers is $1 million.

Flexible manufacturing systems. 12.6% of the total respondents reported planning FMS purchases over the next three years, and, like cells, FMS purchasers tend to be located in larger plants. (An FMS was defined in the survey as comprising multiple materials handling devices servicing multiple machines with a computer responsible for coordinating, pacing and scheduling.) The median 1987 investment for those planning FMS purchases in 1987-89 is $2.7 million.

Robotics. 29.4% of the responding plants will buy robots in the next three years, down from 34.5% one year ago. (See Table II)

Computers. 78% of the total respondents plan installation of computers for their manufacturing operations during 1987-89. Computerized data system usage for this segment ranks as indicated in Table III.

Lasers. 12.5% of the total respondents report their plans include purchase of lasers over the next three years. About 85% of these plants employ 100 or more persons. Typically, the laser purchasing plant will spend $750,000 (median) for production equipment. 46.3% will purchase lasers for gaging and measuring purposes, 35.5% for cutting operations, 25.2% for welding, 11.2% for drilling operations, and 7.9% for heat treatment. Respondents indicated they would purchase more CO_2 than YAG lasers by a ratio of 5:4. P

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FOR MANAGERS OF MANUFACTURING TECHNOLOGY

Planning Manufacturing Change Today, Tomorrow,

and Beyond

For the Large Plant. . . For the Smaller Company

Capital Spending Plans

PRODUCTION

MARCH 1987

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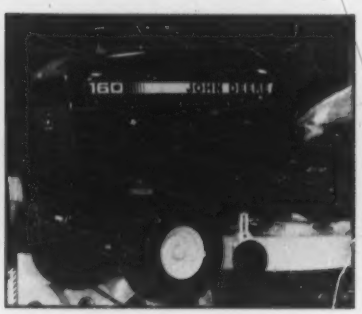

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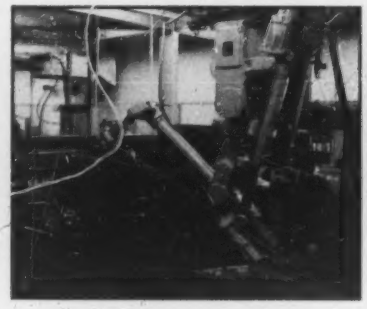

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Capital Spending: Outlook & Trends for 1987 and Beyond

Compare your capital spending outlays, cost targets, reasons for spending with others in your industry. This outlook should help you take measure of your manufacturing position.

By Edward D. McCallum, Jr.
Market Research Consultant

ALL IN ALL...YOU REQUESTED $10.5 billion for 1987 machinery/equipment needs. However, you expect approvals for only $8.15 billion. This is the figure used for all projections of your spending intentions.

This information was gathered in the fall of 1986, when you responded to PRODUCTION's 19th annual survey of capital spending intentions for machinery/equipment which you planned to use in the discrete parts manufacturing and assembly industries (SICs 34-38).

Spending Attitudes at Time of Survey

Only 35.4% of you plan to increase your spending over 1986– down 5% from the previous year. 21.2% plan to spend less, compared to 17.4% in 1986. 40.6% plan no change. In terms of orders, 33% reported an increase, as 8.7% saw a decrease. About one-third were upbeat about 1987; 7.2% had a pessimistic outlook. In each of these cases, the 1987 position is weaker than that of 1986. Put it all together and we come up with a flat forecast of your spending intentions for 1987...about the same as 1986.

In the broadest sense, you are typical if your plant is planning to allo-

TABLE I

Spending Profile Based on Plant Size

No. Of Employees	Machinery/ Equipment Expenditures
less than 50	$160,000
50-99	$518,000
100-499	$630,000
500-999	$937,000
1,000 or more	$2,100,000

cate your capital budget as depicted in Figure 1. You are also typical if, in 1987, your plant size and expenditures compare to those in Table I.

Additional points of comparison for 1987 are:

• You expected to obtain approval for 77.9% of your submitted machinery/equipment budget and to have an approved budget in hand by December, 1986.

• You were operating at 75% of capacity in August-September of 1986, down slightly from the period in 1985. Interestingly, 53.1% plan to operate at a higher level of capacity in 1987 with only 6.9% at a lower level.

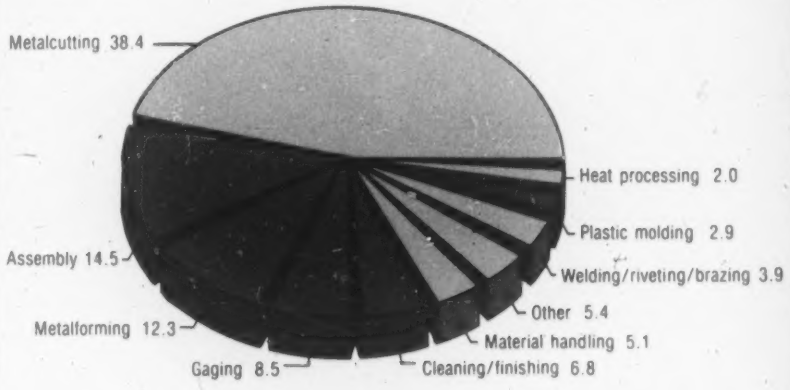
• Your company continues to require a 32% first-year return-on-investment (pre-tax) in justifying new equipment—unchanged over the past few years and still a substantial hurdle to jump when justifying certain types of capital equipment.

• **Electrical discharge machines.** 10.7% are planning EDM purchases over the next three years, down slightly from last year. Approximately 50% of these planned purchases will be made by first-time users. Wire EDM machines will continue to account for the majority of sales over ram-type as reported in recent surveys. Slightly more than one-fifth of the total respondents report they currently use EDM machines.

• **Manufacturing cells.** 15.6% of the total respondents plan to purchase manufacturing cells over the next three years. It is important to be aware

FIGURE 1

How the Capital Equipment Dollar will be Spent (%)



Note: Color indicates increased investment in the category over last year. To compare changes between 1987 and last year's survey, see Table II.

TABLE II

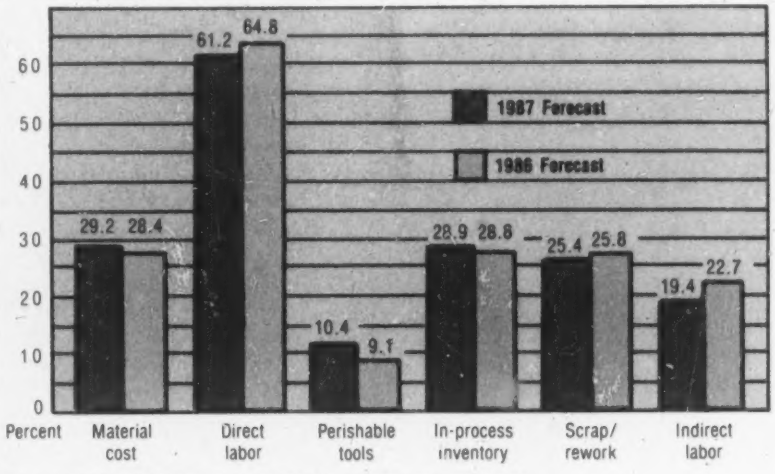
Comparison of Spending Intentions, 1986 and 1987

Machine/Equipment Type	Percent Total Investment 1987	1986	Total Projection (Million $) 1987	1986	Percent Change 1987/1986
Metalcutting	38.4	38.5	3,128	3,245	-3.6
Domestic sourced	48.8	59.5	1,528	1,931	-20.9
Offshore sourced	51.2	40.5	1,600	1,314	+21.8
Assembly	14.5	11.4	1,181	961	+22.9
Metalforming	12.3	11.2	1,003	944	+6.3
Domestic sourced	57.5	68.0	577	642	-10.1
Offshore sourced	42.5	32.0	426	302	+41.1
Gaging/inspection/ testing	8.5	7.2	692	606	+14.2
Cleaning/finishing	6.8	6.5	554	547	+1.3
Other	5.4	11.4	440	961	-45.7
Material handling	5.1	5.2	415	438	-5.3
Welding/riveting/ brazing	3.9	4.0	318	337	-5.6
Plastic molding	2.9	2.6	236	219	+7.8
Heat processing	2.0	2.0	163	168	-3.0

Source: PRODUCTION's Capital Spending Forecasts 1987/1986

FIGURE 2:

Primary Cost Targets for Capital Investment (%)



Source: PRODUCTION's Capital Spending Forecasts 1986/1987

TABLE III

Motives for Planned Machinery/ Equipment Investments (10-year Comparison)*

Motive	5-Year Average 1977-1982**	5-Year Average 1982-1986**	% Change 1982-1986 1977-1981
Cost reduction	47.3	46.8	- 1.1
Increase capacity	38.3	22.5	- 41.3
Improve quality	13.1	19.0	+ 45.0
New model/product	17.1	15.1	- 11.7
Make instead buy	8.7	6.7	- 22.9
Reduce energy	4.4	2.9	- 34.1

**Motives for Capital Equipment Investments*

***Cost reduction:** Still number one on the hit parade as it has been for almost 20 years.*

***Increase capacity:** The fall-off over the last few years reflects the outsourcing trend among many large plants. Those citing a capacity squeeze are located primarily in contractor plants employing 50-500 persons.*

***Improve quality:** Continues to gain in importance, and is becoming a strong reason to purchase new equipment.*

***New models/products:** New capabilities bring some buyers to the market.*

***Make instead buy:** Drop reflects large plant outsourcing.*

***Reduce energy:** Steady decline as result of cheap energy prices; volatile; could change quickly.*

***Percent respondents ranking first. Note: Some respondents ranked more than one motive first.*

Source: PRODUCTION's Capital Spending Forecasts 1977/1986.

TABLE IV

Robots: Current and Future Use

Application	Current Use (% of Respondents)	Plan to Use (% of Respondents)
Arc welding	11.7	14.7
Spot welding	5.6	5.8
Assembly	20.9	28.0
Loan/unload	27.4	34.8
Material handling	15.5	25.4
Spray paint	8.5	10.5
Other	2.8	3.2

Base: Respondents planning robot purchases during 1987-89.

that cells can be machining-oriented, forming-oriented, assembly-oriented, etc. Of those planning purchase of manufacturing cells, almost half (45.0%) already operate cells.

• **Flexible manufacturing systems.** 12.6% of the total respondents plan to purchase flexible manufacturing systems (FMSs) between 1987 and 1989. Of these, 38.0% report they currently operate FMSs, 67.1% report they plan to also operate manufacturing cells over the next three years, and 41.7% report they operate manufacturing cells now.

A *manufacturing cell* was defined in the survey as comprising one material handling device servicing multiple machines which are coordinated and paced by a computer or programmable controller.

A *flexible manufacturing system (FMS)* was defined as comprising multiple material handling devices servicing multiple machines with a computer responsible for coordinating, pacing and scheduling.

Robotics

29.4% of the responding plants will buy robots in the next three years. This is down from 34.5% last year. Slightly over two-thirds of those planning robotic purchases are located in plants with 100 to 1,000 employees. (See Table IV.)

Robot purchase activity is centered in the major industry groups (SICs)

TABLE V

Major Purchase Activity for Robots

SIC	Industry	Percent of Respondents Planning Robot Purchases
34	Fabricated metal products (Primarily SICs 342, 346, 349)	20.7
35	Machinery, except electrical (Primarily SICs 354, 356, 3573, 358)	33.2
36	Electrical Machinery (Primarily, SICs 361, 362, 364, 367)	23.5
37	Transportation Equipment (Primarily SICs 3714, 3724)	15.1
38	Instruments (Primarily SICs 382, 384)	7.6

TABLE VI

Major Purchase Activity for Lasers

SIC	Industry	Percent of Respondents Planning Laser Purchases
34	Fabricated metal products (Primarily SICs 342, 346)	11.7
35	Machinery, except electrical (Primarily SICs 3511, 3541, 3544, 3545, 3561, 356, 3573, 3599)	39.7
36	Electrical machinery (Primarily SICs 361, 366, 367)	14.9
37	Transportation equipment (Primarily SICs 3714, 3724, 3728, 376)	15.9
38	Instruments (Primarily SICs 3811, 382, 383, 384)	17.8

TABLE VII

Offshore Purchasing

SIC	Industry	Percent of Total Respondents Planning Offshore Purchases	Percent of Appropriation going Offshore
3429	Cutlery, hand tools, hardware	54.8	47.1
3451	Screw machine products	65.2	52.0
3469	Metal stampings, NEC	55.2	38.1
3494	Valves and pipe fittings	67.9	41.3
3499	Fabricated metal products, NEC	69.5	38.1
3541	Metalcutting machine tools	62.5	38.8
3542	Metalforming machine tools	46.2	41.6
3544	Dies, tools, jigs, molds	61.9	56.4
3545	Machine tool accessories	47.8	54.5
3551	Food products machinery	64.3	38.3
3559	Special industry machinery, NEC	50.0	44.0
3561	Pumps and pumping equipment	64.0	42.8
3562	Ball and roller bearings	50.0	40.1
3566	Speed changers, drivers, gears	62.5	54.5
3569	General industrial machinery, NEC	58.6	43.2
3599	Machinery, except electrical, NEC	66.3	60.4
3612	Power, distribution and specialty transformers	64.7	36.4
3621	Electric motors	47.6	39.7
3662	Radio and TV transmitting, signaling, and detection equipment and apparatus	61.1	40.7
3679	Electronic components, NEC	54.3	29.8
371	Motor vehicles, motor vehicles parts	60.0	38.2
3724	Aircraft engines	82.4	53.6
3728	Aircraft parts	67.8	42.1
382	Measuring and controlling instruments	53.1	36.9
384	Medical, dental and surgical instruments	64.9	31.9

noted in Table V. Individual industries showing major activity are indicated.

Lasers

12.5% of the total respondents plan to purchase lasers during the next three years. The lasers will be going into larger plants—84.2% of planned buyers are in plants with 100 or more employees; 34.2% are in plants with 500 or more—thus continuing a trend. Type of laser was indicated by 61.2% of the respondents. The selections: 49.6% for CO_2; 39.7% for YAG; 32.1% for helium-neon. Planned applications are gaging/measurement, 46.3%; cutting, 35.5%; welding, 25.2%; drilling, 11.2%; heat treating, 7.9%. Major purchasing activity is centered in the industries noted in Table VI.

Offshore Sourcing

49.9% of the total respondents plan to purchase 42% of their 1987 capital equipment from offshore sources. Although this means fewer are going abroad as compared to last year, they are spending a larger percentage of their budgets with foreign suppliers than last year's respondents indicated. 52.9% plan to buy metalcutting machines; 15.0% metalforming machines; 16.3% gaging/inspection/testing equipment; 31.1% other types of equipment, including assembly, joining, plastic molding, and heat processing. Quality is the number one reason for offshore sourcing. It was picked by 71.2% of the respondents, followed by price, 68.4%; availability, 40.2%, and service, 24.3%.

Industries with a high proportion of respondents planning major offshore purchases are shown in Table VII.

Spending Patterns

For each of the nine production equipment categories listed, the industries cited are those that account for at least 75% of the planned 1987 investments for that particular type of equipment. Industries not listed do not make significant investments in equipment of that type. Comparing your company's investment plans with your industry is simple. Determine the amounts, by percentage, of total capital expenditures budgeted for each of the equipment categories. Then compare those amounts with the listings.

Assembly Machines/Equipment

The average respondent will allocate 14.5% of total investment to assembly machines/equipment.

SIC	Industry	Percent of Total Capital Expenditures
342	Cutlery, hand tools, hardware	16.0
348	Ordnance and access, except vehicles and guided missiles	16.7
357	Office, computing and accounting machines	40.8
361	Electrical transmission and distribution equipment	24.9
362	Electrical industrial apparatus	27.4
363	Household appliances	25.0
364	Electric lighting and wiring devices	26.6
365	Radio and TV receiving equipment, except communication types	38.8
366	Communications equipment	31.7
367	Electronic components and access	33.8
369	Miscellaneous electrical machinery, equipment and supplies	41.9
371	Motor vehicles, motor vehicle equipment	14.1
375	Motorcycles, bicycles and parts	35.0
379	Miscellaneous transportation equipment	20.0
381	Engineering, laboratory, scientific and research instruments and equipment	26.0
382	Measuring and controlling instruments	24.9
384	Surgical, medical and dental instruments and supplies	28.1
387	Watches, clocks, clockwork operated devices, and parts	60.0

Cleaning and Finishing Equipment

The average respondent will allocate 6.8% of total investment to cleaning and finishing equipment.

SIC	Industry	Percent of Total Capital Expenditures
341	Metal cans and shipping containers	9.8
342	Cutlery, hand tools, hardware	9.8
343	Heating equipment, except electric and warm air; and plumbing fixtures	18.9
344	Fabricated structural metal products	11.1
347	Coating, engraving and allied services	50.4
348	Ordnance and access, except vehicles and guided missiles	7.6
349	Miscellaneous fabricated metal products	8.4
352	Farm and garden machinery and equipment	11.0
353	Construction, mining and materials handling machinery and equipment	8.8
358	Refrigeration and service industry machinery	7.4
361	Electrical transmission and distribution equipment	8.0
363	Household appliances	16.3
364	Electric lighting and wiring equipment	11.5
365	Radio and TV receiving equipment, except communications types	14.9
367	Electronic components and accessories	7.7
371	Motor vehicles and motor vehicle equipment	7.1
373	Ship and boat building and repairing	12.3
374	Railroad equipment	12.1
375	Motorcycle, bicycles and parts	10.0
381	Engineering, laboratory, scientific and research instruments and equipment	7.6
383	Optical instruments and lenses	10.5
387	Watches, clocks, clockwork-operated devices, and parts	12.5

Plastic Molding Equipment

The average respondent will allocate 2.9% of total investment to plastic molding equipment.

SIC	Industry	Percent of Total Capital Expenditures
341	Metal cans and shipping containers	.5
342	Cutlery, hand tools, hardware	3.2
343	Heating equipment, except warm air; and plumbing fixtures	5.1
346	Metal forgings and stampings	2.7
354	Metalworking machinery and equipment	3.1
355	Special industry machinery	3.6
357	Office, computing and accounting machines	3.8
358	Refrigeration and service industry machinery	2.7
361	Electrical transmission and distribution equipment	3.0
362	Electrical industrial apparatus	7.9
363	Household appliances	11.3
364	Electric lighting and wiring equipment	8.3
365	Radio and TV receiving equipment, except communications types	8.2
367	Electronic components and access	2.8
375	Motorcycles, bicycles and parts	20.0
383	Optical instruments and lenses	15.8
384	Surgical, medical and dental instruments and supplies	8.7
386	Photographic equipment and supplies	6.0
387	Watches, clocks, clockwork-operated devices and parts	7.5

Material Handling Equipment

The average respondent will allocate 5.1% of total investment to material handling equipment.

SIC	Industry	Percent of Total Capital Expenditures
342	Cutlery, hand tools, hardware	8.8
343	Heating equipment, except electric and warm air; and plumbing fixtures	6.3
344	Fabricated structural metal products	7.2
346	Metal forgings and stampings	5.5
347	Coating, engraving and allied services	6.5
348	Ordnance and access, except vehicles and guided missiles	6.2
352	Farm and garden machinery and equipment	16.0
353	Construction, mining and materials handling machinery and equipment	6.0
356	General industrial machinery and equipment	5.6
357	Office, computing and accounting machines	6.2
358	Refrigeration and device industry machinery	5.6
361	Electrical transmission and distribution equipment	5.7
362	Electrical industrial apparatus	6.9
363	Household appliances	6.4
364	Electric lighting and wiring equipment	8.8
366	Communications equipment	6.7
369	Miscellaneous electrical machinery, equipment and supplies	8.7
371	Motor vehicles, motor vehicle equipment	5.3
373	Ship and boat building and repairing	13.4
374	Railroad equipment	6.5

Heat-processing Equipment

The average respondent will allocate 2.0% of total investment to heat-processing equipment.

SIC	Industry	Percent of Total Capital Expenditures
341	Metal cans and shipping containers	23.8
342	Cutlery, hand tools, hardware	4.6
346	Metal forgings and stampings	4.1
348	Ordnance and access, except vehicles and guided missiles	6.9
349	Miscellaneous fabricated metal products	2.1
354	Metalworking machinery and equipment	2.7
358	Refrigeration and service industry machinery	2.1
361	Electrical transmission and distribution equipment	8.6
363	Household appliances	3.0
365	Radio and TV receiving equipment, except communications types	3.0
367	Electronic components and access	2.5
369	Miscellaneous electrical machinery, equipment and supplies	2.2
371	Motor vehicles, motor vehicle equipment	2.6
372	Aircraft and parts	4.6
373	Ship and boat building and repairing	2.6
374	Railroad equipment	9.3
376	Guided missiles and space vehicles and parts	6.1
379	Miscellaneous transportation equipment	7.0
383	Optical instruments and lenses	8.8
384	Surgical, medical and dental instruments and supplies	2.5

Welding/Riveting/Brazing Equipment

The average respondent will allocate 3.9% of total investment to welding/riveting/brazing equipment.

SIC	Industry	Percent of Total Capital Expenditures
341	Metal cans and shipping containers	6.6
344	Fabricated structural metal products	7.6
346	Metal forgings and stampings	5.0
349	Miscellaneous fabricated metal products	7.8
352	Farm and garden machinery and equipment	9.6
353	Construction, mining and materials handling machinery and equipment	6.9
355	Special industry machinery	5.0
357	Office, computing and accounting machines	4.3
358	Refrigeration and service industry machinery	8.1
361	Electrical transmission and distribution equipment	4.4
369	Miscellaneous electrical machinery, equipment and supplies	4.1
371	Motor vehicles, motor vehicle equipment	5.6
372	Aircraft and parts	3.7
373	Ship and boat building and repairing	14.3
374	Railroad equipment	14.9
375	Motorcycles, bicycles and parts	10.0
379	Miscellaneous transportation equipment	14.8
384	Surgical, medical and dental instruments and supplies	5.7

Metalforming Machinery/Equipment

The average respondent will allocate 12.3% of total investment to metalforming machinery and equipment.

SIC	Industry	Percent of Total Capital Expenditures
341	Metal cans and shipping containers	17.2
342	Cutlery, hand tools, hardware	18.5
343	Heating equipment, except electrical and warm air; and plumbing fixtures	28.9
344	Fabricated structural steel products	26.8
346	Metal forgings and stampings	41.6
347	Coating, engraving, and allied services	22.2
349	Miscellaneous fabricated metal products	15.5
353	Construction, mining, and materials handling machinery and equipment	13.4
358	Refrigeration and service industry machinery	32.3
361	Electrical transmission and distribution equipment	14.4
363	Household appliances	20.3
364	Electric lighting and wiring equipment	18.8
371	Motor vehicles and motor vehicle equipment	10.5
374	Railroad equipment	21.4
375	Motorcycles, bicycles and parts	15.0
376	Guided missiles and space vehicles and parts	16.4
379	Miscellaneous transportation equipment	20.6

Metalcutting Machine Tools

The average respondent will allocate 38.4% of total investment to metalcutting machine tools.

SIC	Industry	Percent of Total Capital Expenditures
345	Screw machine parts	63.1
348	Ordnance and access; except vehicles and guided missiles	42.5
349	Miscellaneous fabricated metal products	33.9
351	Engines and turbines	67.3
353	Construction, mining and materials handling machinery and equipment	45.7
354	Metalworking machinery and equipment	60.8
355	Special industry machinery	51.8
356	General industrial machinery and equipment	52.2
359	Miscellaneous machinery, except electrical	68.1
371	Motor vehicles and motor vehicle equipment	41.3
372	Aircraft and parts	66.5
376	Guided missiles and space vehicles and parts	42.3
386	Photographic equipment and supplies	50.9

Gaging/Inspection/Testing Equipment

The average respondent will allocate 8.5% of total investment to gaging/inspection/testing equipment.

SIC	Industry	Percent of Total Capital Expenditures
345	Screw machine products	9.1
346	Metal forgings and stampings	7.1
348	Ordnance and access, except vehicles and guided missiles	9.1
349	Miscellaneous fabricated metal products	9.2
351	Engines and turbines	8.6
354	Metalworking machinery and equipment	9.4
357	Office, computing and accounting machines	9.8
359	Miscellaneous machinery, except electrical	9.8
362	Electrical industrial apparatus	9.5
365	Radio and TV receiving equipment, except communications types	11.2
366	Communication equipment	13.9
367	Electronic components and access	11.9
369	Miscellaneous electrical machinery, equipment and supplies	8.3
371	Motor vehicle, motor vehicle equipment	9.6
372	Aircraft and parts	8.9
381	Engineering, laboratory, scientific and research instruments and equipment	12.2
382	Measuring and controlling instruments	19.2
383	Optical instruments and lenses	16.7
387	Watches, clocks clockwork-operated devices, and parts	16.0

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During the past seven years, however, instances of manufacturing excellence have, in fact, intensified and grown in number throughout this country and across industry classification.

Ironically, such successes and failures are attributable to the same root cause—JIT.

What It Is, What It Is Not

The JIT concept is not a radical departure from traditional manufacturing methods, nor is it a mystical extension of the Japanese culture. In fact, its roots are as American as the proverbial apple pie, or more exactly, Henry Ford's pioneering manufacturing methods, typified by the assembly line.

JIT has evolved from more than a century of developing manufacturing techniques, such as those preached by Ford, Deming, Juran, and others. Some Japanese manufacturers, most notably Toyota Motor Corp., like their American counterparts, have served as a sort of laboratory incubator, implementing and refining JIT manufacturing concepts to the point of optimal benefit.

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The most pronounced, and dangerous, departure from Common Sense Manufacturing is the JIT misconception that drastic inventory reductions are the panacea for all manufacturing operations.

Common sense tells you that jumping into a stockless production scenario serves only to push financial liability to suppliers (who are likely to stumble under the burden) and accomplishes nothing to promote quality, product reliability, productivity or long term, consistent profitability.

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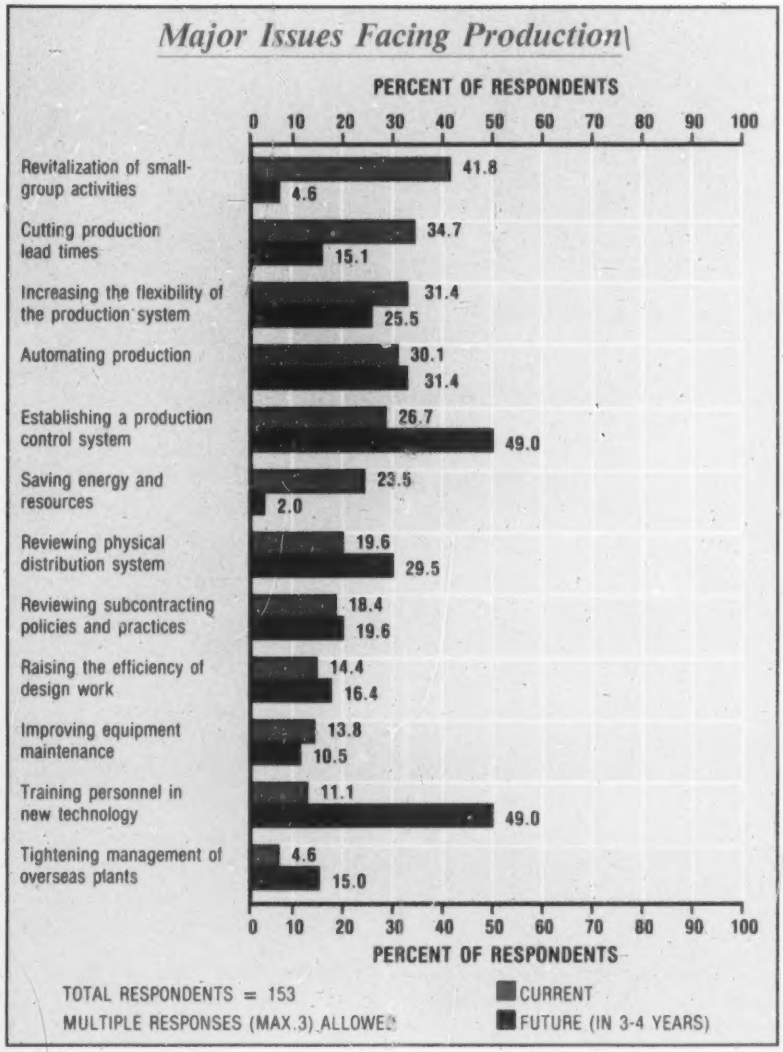

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All Japanese companies are not proficient in JIT and Common Sense Manufacturing techniques. It was only in 1984, for example, that a Sumitomo Electric company plant in Japan, experiencing so many problems that a 50 percent defect rate was considered normal, embarked on its manufacturing improvement program, known as Day-To-Day Management.

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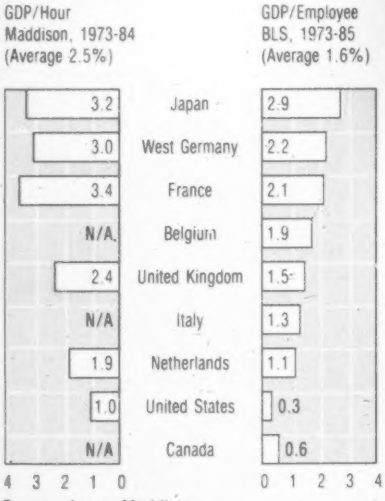
International Productivity Growth (Percent)



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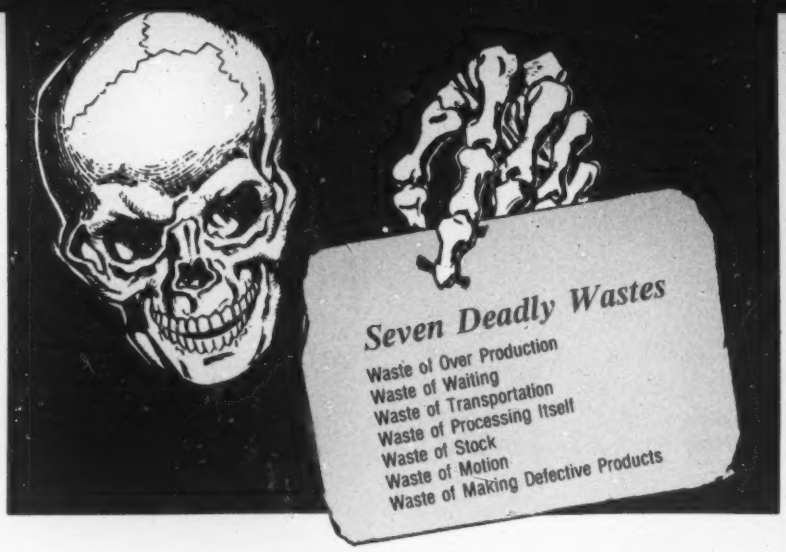

JIT Opportunities (Improvement Percentages)

	Automotive Components Repetitive	**Flexible Packaging** Process	**Electrical Cons. Goods** Repetitive	**Mechanical Equipment** Job Shop	**Fashion Goods** Repetitive
Manufacturing Lead Time Reduction	89	86	85	83	92
Productivity Increase					
Direct	19	50	N/A	5	29
Indirect/Salary	60	50	38	21	29
Scrap/Rework Reduction	50	63	26	33	61
Purchased Material Price Reduction	N/A	7	N/A	6	11
Inventory Reduction					
Raw Material	35	70	50	73	70
WIP	89	82	85	70	85
Finished Goods	61	71	90	0	70
Setup Reduction	75	75	94	75	91
Space Reduction	53	N/A	80	N/A	39
Capacity Increase	N/A	36	N/A	N/A	42

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Always remember "continuous and relentless elimination of waste." The initial investment is people's time. The gains are: NUMMI—twice as productive as the GM norm; Omark—eliminated $3 million finished goods inventory; AMOT—reduced set-up by 75 percent by changing the process sequence, not an investment; Harley-Davidson, York, PA—50 percent reduction in inventory, reduced scrap and rework by 59 percent, increased productivity by 32 percent; Navistar, Chicago—$500 million inventory reduction, productivity up to 14 units per employee from eight units per employee in 1981. P

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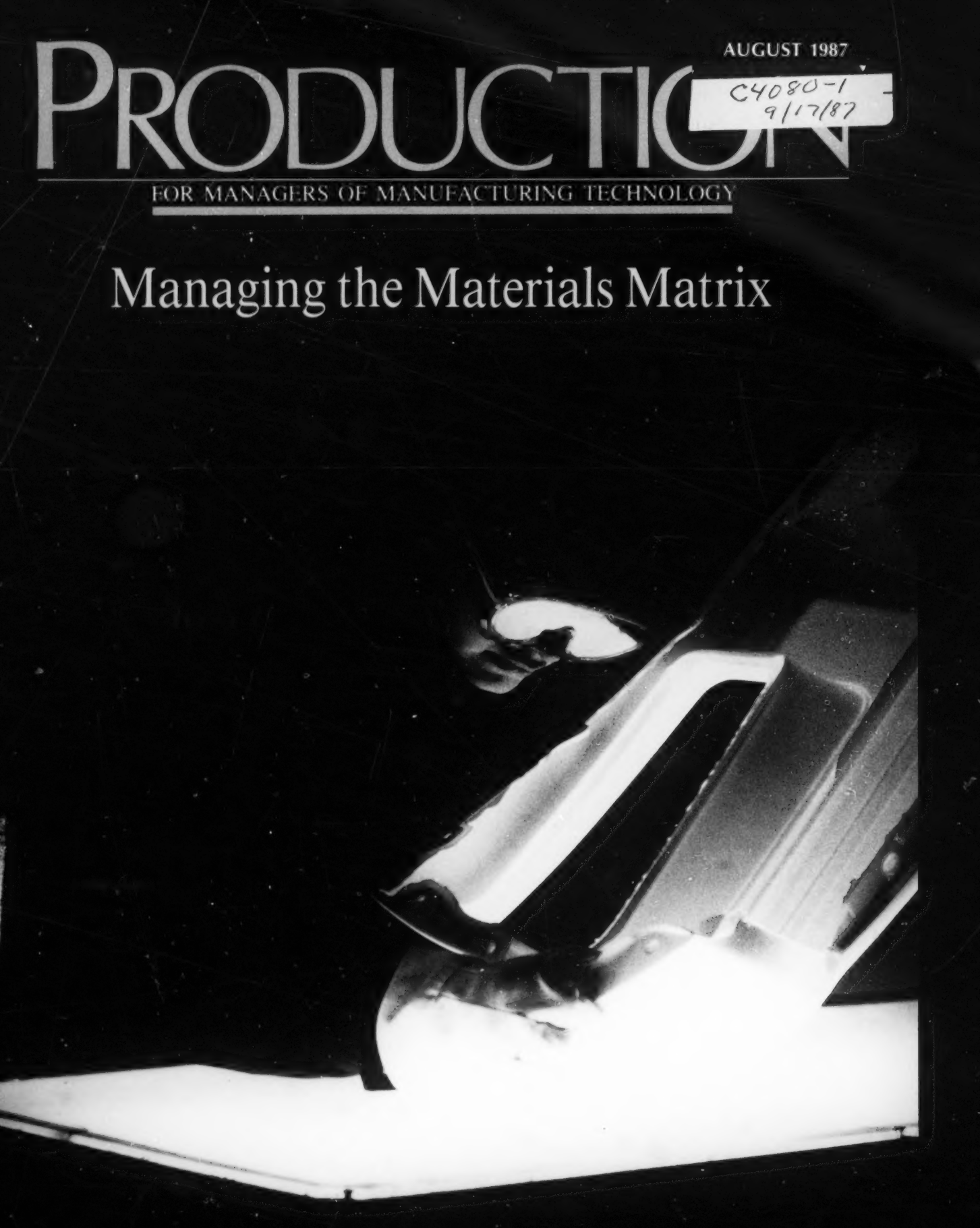

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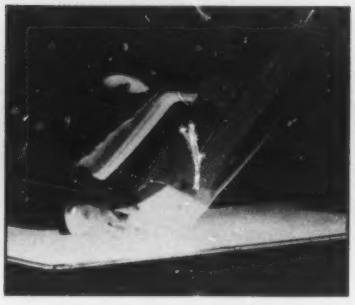

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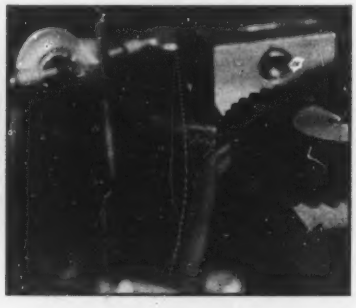

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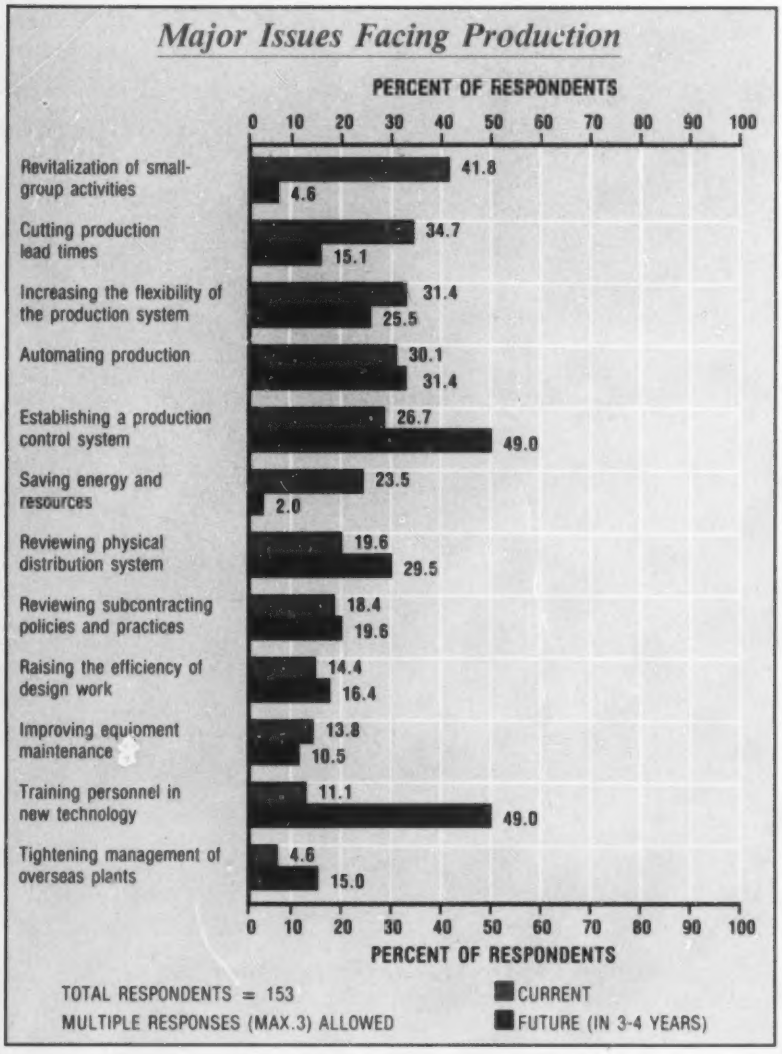

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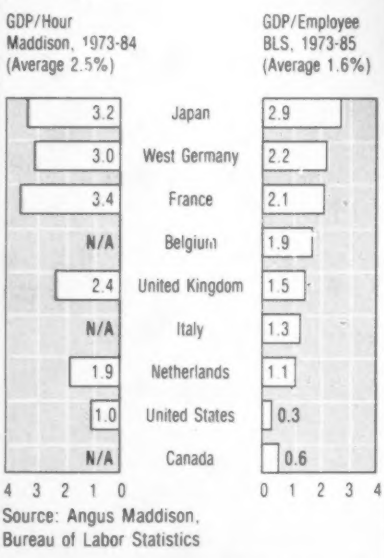

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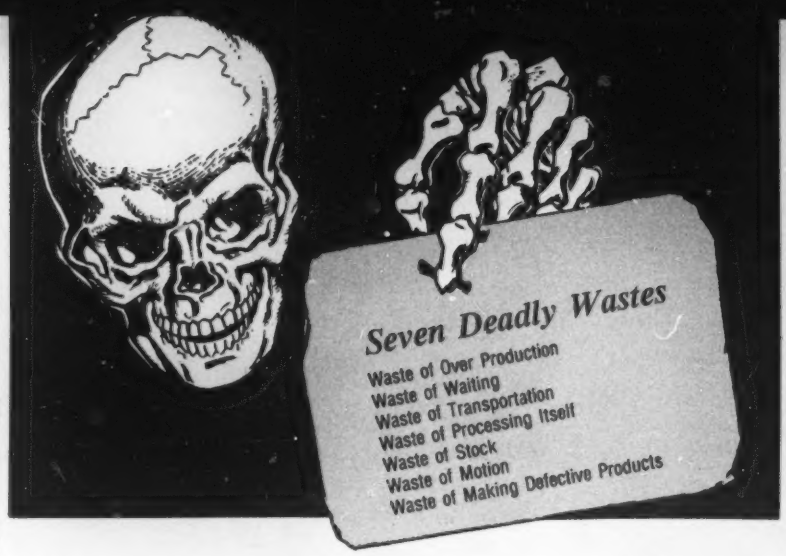

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